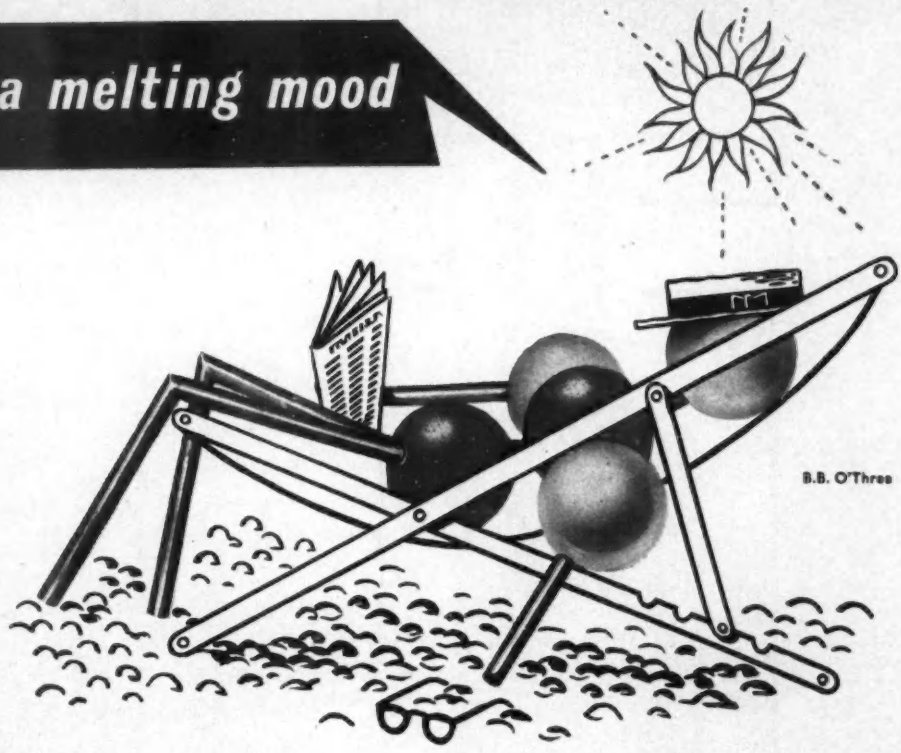
Chemical Age

'm always in a melting mood



Mule Team ' Boric Oxide (B_2O_3) softens at about 325°C (617°F), and mes fully fluid at about 800°C (932°F). Because of its great affinity various metallic and basic oxides, it is widely used in the prepara- of fluxes. Providing as it does a means of adding boric oxide out any other elements, it is valuable in the preparation of special es and enamels. It is also used in the manufacture of metallic tes, borides, ferro-boron and boron alloys.

further information on the uses and advantages of any of these n products, consult our technical and research department.

Principal
' 20 MULE TEAM '
Products

BORIC OXIDE · BORIC ACID
*DEHYBOR anhydrous borax
*NEOBOR pentahydrate borax
BORAX (Decahydrate)

20 MULE TEAM

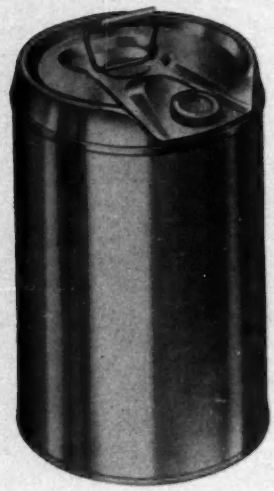
BORIC OXIDE

RAX CONSOLIDATED LIMITED

BORAX HOUSE · CARLISLE PLACE · LONDON S.W.I · VICTORIA 9070

20 Mule Team. *Regd. Trade Mark**

TGA 8X111



K.C.C. INTERRUPTED CHIMB DRUM

BROUGHS DRUMS

HEAVY RETURNABLE TAPER

LIGHT GAUGE
LONG CONE TAPER

FULL OPEN TOP DRUM
WITH SIMPLOX CLOSING RING

USED BY LEADING INDUSTRIES THROUGHOUT THE WORLD

E.A. BROUGH & CO. LTD.

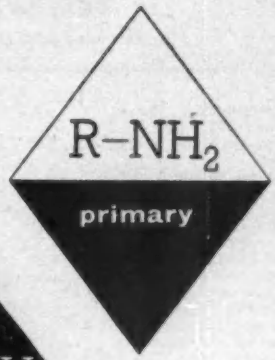
PHONES · ROYAL 3031
HUNTS CROSS 2071

4 UPPER PARLIAMENT STREET · LIVERPOOL 8 & SPEKE

There's a Brough's Drum for Every Purpose

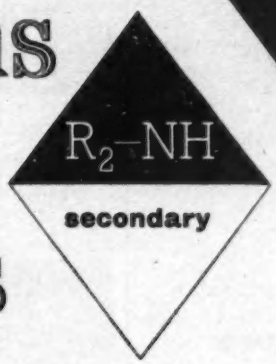
HIGH MOLECULAR WEIGHT ALIPHATIC AMINES

armeens



AND AMINE ACETATES

armacs



The Chemical Division of Armour & Co. Ltd. have detailed technical information on applying their ARMEENS and ARMACS in many industries. We may have a ready-to-use formula to fit your case.

ARMEENS are a range of primary aliphatic amines RNH_2 or secondary aliphatic amines R_2NH in which R represents pure or mixed fatty acid radicals. *Armeens* are strongly cationic and water repellent, and dissolve in oils and most solvents. They are substantive to metals, pigments, fibres, paper, glass, masonry, stones, plants, synthetic resins, etc. They are capable of additive and other chemical reactions.

ARMACS are the acetate salts of the ARMEENS and are water soluble. In all other respects they resemble the Armeens.

Write on your business paper for new booklets on 'Armeens' and 'Armacs'. All of the Armeens and Armacs are now freely available.

ARMOUR & COMPANY LTD., CHEMICAL DIVISION, LINDSEY ST., LONDON, E.C.1

Telephone: CLErkenwell 9011 International Telex 23567

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
229	A.P.V. Co., Ltd., The	398
344	Acalor (1948) Ltd.	—
209	Accrington Brick & Tile Co., Ltd., The	—
176	Adequate Weighers Ltd.	—
	Aero Research Ltd.	—
223	Aimer Products Ltd.	—
159	Albany Engineering Co. Ltd., The	—
	Alexander, Herbert, & Co., Ltd.	—
165	Allen, Edgar, & Co., Ltd.	—
364	Alumina Co., Ltd., The	—
328	Amalgamated Oxides (1939) Ltd.	—
306	Armour & Co., Ltd.	381
G/Cd.	Ashmore, Benson, Pease & Co.	—
189	Ashworth, Arthur, Ltd.	—
	Associated Lead Mfrs. Ltd.	—
G/Cd.	Audley Engineering Co., Ltd.	—
146	Autometric Pumps Ltd.	—
212	B. A. Holland Engineering Co., Ltd., The	—
282	Baker Perkins Ltd.	421
324	Baker Platinum Division, Engelhard Industries Ltd.	—
233	Balfour, Henry, & Co.	—
210	Barclay Kellett & Co., Ltd.	—
250	Bennett, Sons & Shears Ltd.	—
G/Cd.	Berk, F. W. & Co., Ltd.	—
242	Beryllium & Copper Alloys (Safety Tools) Ltd.	—
	Bivac Air Co. Ltd.	386
270	Black, B., & Son, Ltd.	—
2	Blackman Keith Ltd.	—
204	Blundell & Crompton Ltd.	384
148	Borax Consolidated Ltd.	Front cov.
	Borax & Chemicals Ltd.	—
289	Boulton, William, Ltd.	—
228	Bowmans Chemicals Ltd.	—
270	Braby, Fredk., & Co., Ltd.	—
183	Bramigk & Co., Ltd.	—
	British Acheson Electrodes Ltd.	—
224	British Arca Regulators Ltd.	—
217	British Carbo Norit Union Ltd.	—
	British Ceca Co., Ltd., The	396
216	British Chrome & Chemicals Ltd. (London)	—
230	British Chrome & Chemicals Ltd. (Lancs)	385
	British Drug Houses Ltd., The	—
	British Geon Limited	—
8	British Industrial Solvents	—
236 & 237	British Laboratory Ware Association Ltd.	—
275	British LaBour Pump Co., Ltd.	—
240	British Lead Mills Ltd.	—
360	British Railway Traffic & Electric Co., Ltd.	—
Spine	British Resin Products Ltd.	—
172	British Rototherm Co., Ltd., The	—
227	British Steam Specialties Ltd.	—
168	British Tar Products Ltd.	—
	British Thomson-Houston Co. Ltd.	391
170	British Titan Products Co., Ltd.	—
397	Broadbent, Thomas, & Sons, Ltd.	—
231	Brotherhood, Peter, Ltd.	—
244	Brotherton & Co., Ltd.	—
	Brough, E. A., & Co., Ltd.	—
234	Browns Foundry Co., Ltd.	—
218	Brush Design Group, The	—
175	Bryan Donkin Co., Ltd., The	cov. iv
180	Buell (1952) Ltd.	—
272	Burnett & Rolfe Ltd.	—
	Buss Ltd.	—
	Butterworths Scientific Publications	—
201	Butterfield, W. P., Ltd.	—
160	Calder Vale Glassworks Ltd.	—
	Callow, F. E. (Engineers) Ltd.	—
	Callow Rock Lime Co. Ltd., The	—
354	Candy Filter Co., Ltd., The	—
	Cannon (G. A.) Ltd.	—
238	Carbon Dioxide Co., The	—
280	Carmichael, John R., Ltd.	—
243	Catalin Ltd.	—
	Chapman & Hall Ltd.	—
	Chemical Construction (Great Britain) Ltd.	—
191	Chemical Workers' Union, The	—
	Chemicals & Feeds Ltd.	—
318	Chemitrade Ltd.	392
284	Chesterfield Tube Co., Ltd., The	—
203	Ciech (Poland)	cov. iii
264	Cinema Television Ltd.	—
224	Clark, T. & C., & Co., Ltd.	—
	Classified Advertisements	422, 423
258	Clayton Dyestuffs Co. Ltd., The	—
199	Clayton, Son & Co., Ltd.	—
288	Clydesdale Chemical Co. Ltd.	—
285	Clyde Tube Forgings Ltd.	—
213	Cole, R. H., & Co., Ltd.	—
208	Cole & Wilson Ltd.	—
204	Collins Improved Firebars Ltd.	—
	Colt Ventilation Ltd.	—
	Colvin-Smith Ltd.	—
348	Comet Pump & Eng. Co. Ltd., The	—
	Constable & Co.	—
	Controlled Convection Drying Co.	—
	Costain-John Brown Ltd.	—
4	Crofts (Engineers) Ltd.	—
	Cromil & Piercy Ltd.	—
171	Cruickshank, R., Ltd.	—
334	Curran, Edward, Engineering Ltd.	—
304	Cyanamid Products Ltd.	—
222	Cyclops Engineering Co. Ltd., The	—
288	Cygnet Joinery Ltd.	—
286	Danks of Netherton Ltd.	—
216	Davey, Paxman & Co., Ltd.	—
	Dawson, McDonald & Dawson Ltd.	394
170	Derby Luminescents Ltd.	—
161	Dorr-Oliver Co., Ltd.	392
280	Douglas, William, & Sons Ltd.	—
200	Dowlow Lime & Stone Co., Ltd., The	—
	Dring & Fage Ltd.	—
174	Drummond Patents Ltd.	—
195	Dryden, T., Ltd.	390
	Dunlop Rubber Co., Ltd.	—
	Dutt, P. K., & Co., Ltd.	—
232	E.D.C., Ltd.	—
330	Edison Swan Electric Co., Ltd., The	—
	Electric Resistance Furnace Co. Ltd.	—
268	Electronic Switchgear (London) Ltd.	—
244	Electrothermal Engineering Ltd.	—
B/Mk.	Elliott, H. J., Ltd.	—
	Emcer Products	396
	Enamelled Metal Products Ltd.	—
166	English Glass Co., Ltd., The	—
G/Cd.	Erinoid Ltd.	—
207	Evered & Co., Ltd.	—
	Fairey Aviation	—
280	Farnell Carbons Ltd.	—
	Fawcett Finney Ltd.	386
	Ferraris, Fred Ltd.	382
202	Ferris, J. & E., Ltd.	—
	Fleischmann (London) Ltd.	—
220	Film Cooling Towers (1925) Ltd.	—
253	Foxboro-Yoxall Ltd.	—
	Foxflex Ltd.	—
	Fraser, W. J., & Co., Ltd.	—
298	Fuller's Earth Union Ltd., The	—
188	Gallenkamp, A., & Co., Ltd.	—
	Gas Council, The	—
266	Geigy Pharmaceutical Co., Ltd.	—
	General Electric Co., Ltd.	—
	Glebe Mines Limited	—
	Goodyear (Export Div.)	—
290	Graviner Mfg. Co., Ltd.	—
265	Grazebrook, M. & W., Ltd.	—
164	Greeff, R. W., & Co., Ltd.	—
192	Grindley & Co., Ltd.	—
232	Hackbridge & Hewittic Electric Co., Ltd.	—
202	Haller & Phillips Ltd.	395
214	Hanovia Lamps	—
	Hanson Books	—
206	Harris (Lostock Graham) Ltd.	419
222	Haworth, F. (A.R.C.) Ltd.	—
158	Hearson, Charles, & Co., Ltd.	—
238	Herbert, Alfred, Ltd.	—
	Hickson & Welch Ltd.	cov. ii
193	Holroyd, John, & Co., Ltd.	—
234	Honeywill & Stein Ltd.	—
248	Hopkin & Williams Ltd.	—
187	Humphreys & Glasgow Ltd.	—
310	Huntington, Heberlein & Co. Ltd.	—
310	I.C.I. Billingham Organic	383
	I.C.I. General Chemicals Solvents	—
	I.C.I. Plastics—Darvic	—
	I.C.I. Plastics—Fluon.	393
	I.C.I. Ltd., (Plastics Div.) Corvic	—
	Imperial Chemical Industries Ltd.	—

continued on page 384

Rüeger Diffusion Hygrometer

PRECISION MEASUREMENT OF THE RELATIVE HUMIDITY OF THE AIR

- High precision: tolerance about 2% only
- Invariability: resetting or renewal unnecessary
- Built-in high precision thermometer
- Maintenance: the container to be refilled by distilled water every 2-3 months only
- Control of the water level: instantaneous, owing to transparent container
- High degree of sensitiveness
- Direct indication of the relative humidity to an accuracy of 1%

FRED FERRARIS (Clerkenwell) LTD.
14 NORTHAMPTON SQUARE, LONDON, E.C.1. *Tel: CLErkenwell 2676*

PHENOL

A high-quality synthetic product meeting the most stringent requirements of industry.

XYLENOLS

A grade of refined cresylic acid of distillation range approximately 215°-230°C. Total tar acid content 99·5% minimum.

HIGH BOILING TAR ACIDS

Distillation range approximately 220°-260°C. Total tar acid content 99·0% minimum.

ICI

For further information, consult:

IMPERIAL CHEMICAL INDUSTRIES LTD.
LONDON, S.W.1

INDEX TO ADVERTISERS

The first figures refer to advertisement in **Chemical Age Year Book**, *the second to the current issue*

Page		Page
157	Imperial Smelting Corporation (Sales) Ltd.	—
	Industrial & Marine Protective Applications Limited	—
	International Combustion Group	—
	Isopad Ltd.	—
246	Jackson, Henry (Liverpool) Ltd.	—
214	Jackson, J. G., & Crockatt Ltd.	—
245	Jenkins, Robert, & Co., Ltd.	—
249	Jenkinson, W. G., Ltd.	—
3	Jobling, James A., & Co., Ltd.	—
	Johnson, S. H., & Co., Ltd.	—
166	Johnsons of Hendon Ltd.	—
267	Jones, Tate & Co., Ltd.	—
228	K.D.G. Instruments Ltd.	—
178	K. W. Chemicals Ltd.	—
	Kaylene (Chemicals) Ltd.	—
278	Kernick & Son Ltd.	—
395	Kestner Evaporator & Engineering Co., Ltd.	388
395	Kestner Evaporator & Engineering Co., Ltd. (*Keebush*)	—
	Kestner (Industrial Safety) Ltd.	—
	Key Engineering Co., Ltd., The	—
283	Kier, J. L., & Co., Ltd.	—
271	Kleen-e-ze Brush Co., Ltd.	—
206	Lankro Chemicals Ltd.	—
210	Laporte Chemicals Ltd.	388
184	Lavino (London) Ltd.	—
252	Leda Chemicals Ltd.	—
264	Leek Chemicals Ltd.	—
162	Leigh & Sons Metal Works Ltd.	394
	Lennig, Charles, & Co. (Great Britain) Ltd.	—
	Lennox Foundry Co., Ltd.	—
219	Light, L., & Co., Ltd.	—
274	Lind, Peter, & Co., Ltd.	—
Cover	London Aluminium Co. Ltd., The	—
	Longman Green & Co., Ltd.	—
278	Lord, John L., & Son	—
190	Machinery (Continental) Ltd.	—
257	Mallinson & Eckersley Ltd.	—
	Manesty Machines	—
342	Marchon Products Ltd.	—
226	Marco Conveyor & Eng. Co. Ltd.	—
168	Matthews & Yates Ltd.	—
	May & Baker Ltd.	—
173	Measuring & Scientific Equipment Ltd.	—
	Meigh Castings Ltd.	—
Cover	Metal Containers Ltd.	—
	Metalfiltration Co., Ltd.	—
G/Cd.	Metalock (Britain) Ltd.	—
174	Metcalf & Co.	—
	Metropolitan-Vickers Electrical Co., Ltd.	—
178	Middleton & Co., Ltd.	—
	Mills Packard Construction Co., Ltd.	—
215	Mine Safety Appliances Co. Ltd.	—
	Mirrlees Watson Co. Ltd., The	—
180	Mirvale Chemical Co., Ltd.	—
254	Mitchell Cotts & Co., Ltd.	—
	Mond Nickel Co., Ltd., The	—
	Monsanto Chemicals Ltd.	—
	Morgan Crucible Co., Ltd., The	—
200	Moritz Chemical Engineering Co., Ltd.	390
181	Neckar Water Softener Co. Ltd.	—
268	Nederlandse Emballage Ondeernemming Gebr. de Wilde N.V.	—
221	Negretti & Zambra Ltd.	387
	New Metals & Chemicals Ltd.	—
	Newnes, George Co., Ltd.	—
276 & 277	Newton Chambers & Co. Ltd.	—
239	Nicolson, W. B. (Scientific Instruments) Ltd.	—
177	Nordac Ltd.	—
211	North Thames Gas Board	—
194	Northern Malleable Foundry Co., Ltd., The	—
179	Northey Rotary Compressors Ltd.	—
	Nu-Swift Ltd.	—
296	Palfrey, William, Ltd.	—
	Paper Good Manufacturing Co., Ltd.	—
	Pascall Engineering Co. Ltd., The	—
6	Paterson Engineering Co. Ltd., The	—
287	Peabody Ltd.	—
	Penrhyn Quarries Ltd.	384
	Pergamon Press	—
320 & 368	Permutit Co., Ltd., The	—
G/Cd.	Petrocarbon Developments Ltd.	—
	Petrochemicals Ltd.	—
340	Pool, J. F., Ltd.	—
	Pott, Cassels & Williamson	—
358	Powell Duffryn Carbon Products Ltd.	—
G/Cd.	Power-Gas Corporation, Ltd., The	—
169	Price Stutfield & Co., Ltd.	—
	Prodorite Ltd.	—
242	Production Chemicals (Rochdale) Ltd.	—
261	Pye, W. G., & Co., Ltd.	—
	Pyrethrum Board of Kenya	—
	Q.V.F. Ltd.	—
314	Reads Ltd.	—
	Richmond Welding Co., Ltd.	—
	Robinson, F., & Co., Ltd.	—
G/Cd.	Rose, Downs & Thompson Ltd.	—
230	Rotometer Manufacturing Co. Ltd.	—
167	St. Helens Cable & Rubber Co. Ltd.	—
269	Sandiacre Screw Co. Ltd., The	396
182	Scientific Glass-Blowing Co., The	—
285	Shaw Petrie Ltd.	—
255	Sheepbridge Alloy Castings Ltd.	—
356	Shell Chemical Co., Ltd.	389
256	Siebe, Gorman & Co., Ltd.	—
350	Sigmund Pumps Ltd.	—
	Simon, Richard, & Sons, Ltd.	—
344	Southern Instruments Computer Division	—
338	Spencer Chapman & Messel Ltd.	—
	Stabilag Co., Ltd., The	—
396	Stanton Instruments Ltd.	—
	Staveley Iron & Chemical Co. Ltd.	—
212	Steel, J. M., & Co., Ltd.	—
	Stockdale Engineering Co., Ltd.	—
	Stonehouse Paper & Bag Mills	423
	Streamline Filters Ltd.	—
	Sturge, John & E., Ltd.	—
251	Sutcliffe Speakman & Co., Ltd.	—
279	Taylor Rustless Fittings Co., Ltd.	—
235	Tenaplas Sales Ltd.	—
218	Thermal Syndicate Ltd., The	—
196	Thomas & Bishop Ltd.	—
	Thomason, W., & Sons Ltd.	—
145	Thompson, John (Dudley) Ltd.	—
	Todd Bros. (St. Helens & Widnes) Ltd.	—
198	Towers, J. W., & Co., Ltd.	—
197	Trent Valve Co., Ltd.	—
160	Tungstone Products Ltd.	—
259	Unifloc Ltd.	—
	Unilever Ltd.	—
	United Coke & Chemicals Co. Ltd.	—
247	United Filters & Engineering Ltd.	—
	United Kingdom Atomic Energy Authority	—
	Vaughan Crane Co., Ltd.	—
192	W.E.X. Traders Ltd.	—
241	Walker Extract & Chemical Co. Ltd.	—
	Wallach Bros. Ltd.	394
263	Waller, George & Son Ltd.	—
161	Walley, A. L.	—
162	Wallis, Charles, & Sons (Sacks) Ltd.	—
	Ward, Thos. W., Ltd.	—
185	Watson, Laidlaw & Co., Ltd.	—
260	Wells, A. C. & Co., Ltd.	—
182	Wengers Ltd.	—
217	Whessoe Ltd.	—
	Whiffen & Sons Ltd.	397
196	Whitaker, B., & Sons Ltd.	—
163	Widnes Foundry & Engineering Co., Ltd.	—
	Wilkinson, James, & Son, Ltd.	—
186	Wilkinson Rubber Linatex Ltd.	—
273	Willcox, W. H., & Co., Ltd.	—
194	Williams, & James (Eng.) Ltd.	—
172	Wilson, Edward, & Son Ltd.	—
268	Wilde, Gebr. De Nederlandse Emballage Ondernemming N.V.	—
220	Wood, Harold, & Sons Ltd.	394
184	Worcester Royal Porcelain Co., Ltd., The	—
	Worthington-Simpson Ltd.	—
281	Wynn (Valves) Ltd.	—
225	Yorkshire Tar Distillers Ltd.	—
226	Zeal, G. H., Ltd.	—

"Fullersite"

SLATE FILLER

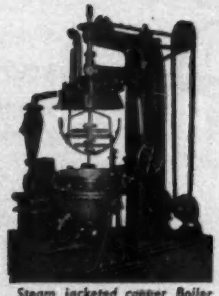
WHEREVER AN INERT FILLER IS REQUIRED FULLERSITE IS THE IDEAL MATERIAL

PENRHYN QUARRIES LTD.

PORT PENRHYN, BANGOR, NORTH WALES

COPPER PLANT

for the CHEMICAL TRADE



Steam jacketed copper Boiler and Mixer to tilt, with vacuum pump and jet condenser. Cover and agitator raised by bevel gear and hand-wheel.

STILLS
RECTIFYING COLUMNS
CONDENSERS

Autoclaves . Calandrias
Vacuum Pans . Boiling Pans
Pipework . Coils . Etc.

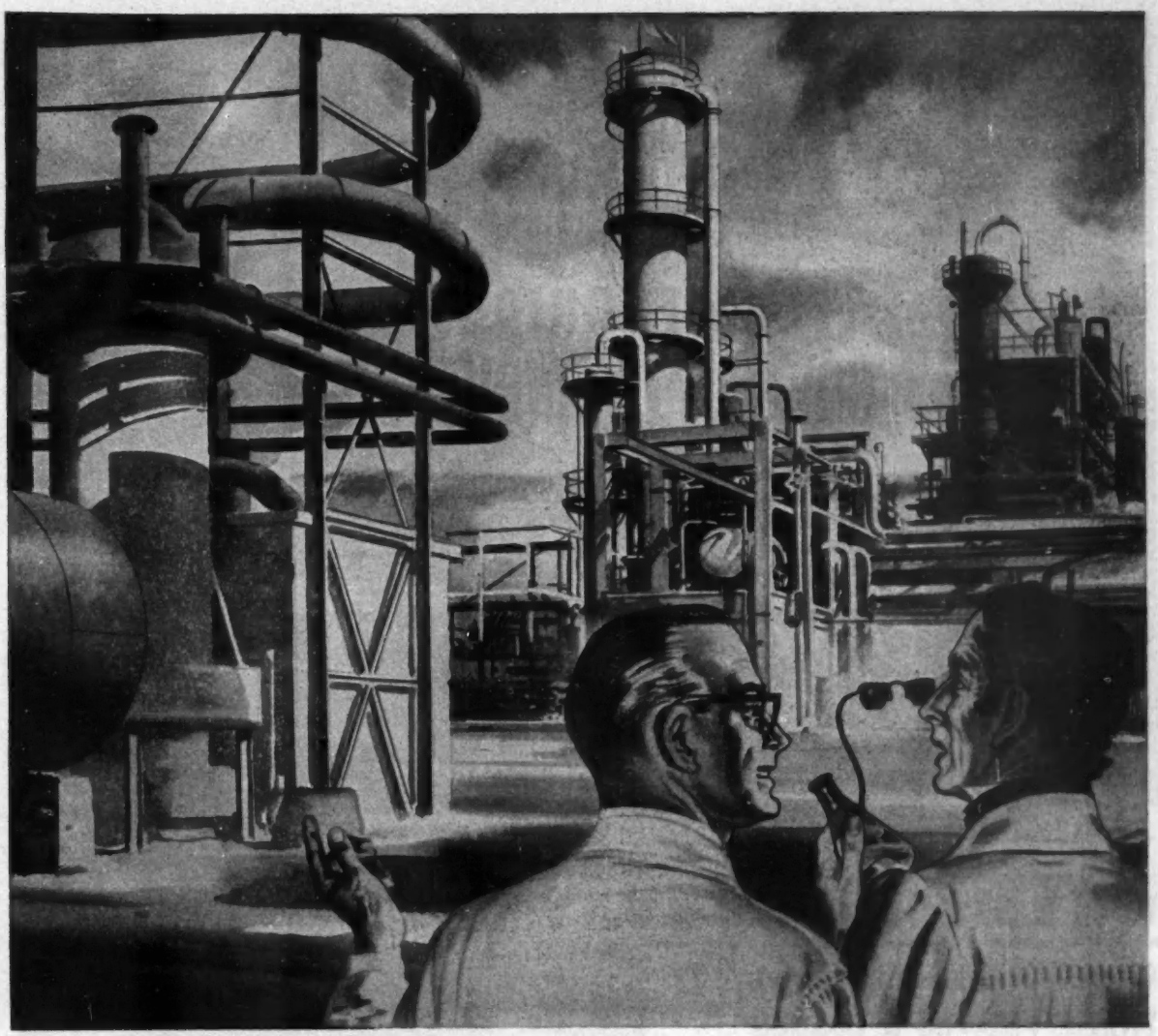
ESTABLISHED 1825

BLUNDELL & CROMPTON LIMITED

WEST INDIA DOCK RD., LONDON, E.14

Phone: East 3838 (3 lines). 1408 & 4160

Grams: Blundell Phone London



131 YEARS OF EXPERIENCE...

... lies behind the Chromium chemicals manufactured by B.C.C. The range of application of Chromium chemicals has considerably widened through the years. The Chemical Industry has become a major contribution to industrial progress, behind which lies the continued availability of B.C.C. Chromium chemicals made to the highest standards of purity.

The improvement of existing products and the development of new applications utilising Chromium's inherent properties is the constant aim of the research teams of B.C.C.

Britain's largest manufacturer of chrome chemicals

SODIUM BICHROMATE · ANHYDROUS SODIUM BICHROMATE · POTASSIUM BICHROMATE · AMMONIUM BICHROMATE
SODIUM CHROMATE · POTASSIUM CHROMATE · CHROMIUM SULPHATE · CHROMIUM OXIDE · CHROMIC ACID

The experience of B.C.C. is at the service of the Chemical Industry.

BRITISH CHROME & CHEMICALS LIMITED, EAGLESCLIFFE, STOCKTON-ON-TEES.

Please write to:—

SALES AND LONDON OFFICE: 6 ARLINGTON STREET, ST. JAMES'S S.W.1.

Telephone: HYDe Park 9516/9 Telegrams: "Chromechem", Piccy, London.

B00 8033

FAWCETT FINNEY LIMITED

STEEL FABRICATIONS COVER ALL INDUSTRIES

Modern fully-equipped shops, backed by a staff of experienced Technicians and Engineers, enable Fawcett-Finney Ltd. to handle any welding or fabrication problem. Pressure Vessels, Heat Exchangers, Chemical Plant, Ships Hatches, Workshop Furniture, Control Cabinets, etc.—all made to customers design and requirements. We shall be pleased to advise you on your particular problem.

FAWCETT-FINNEY LTD.,

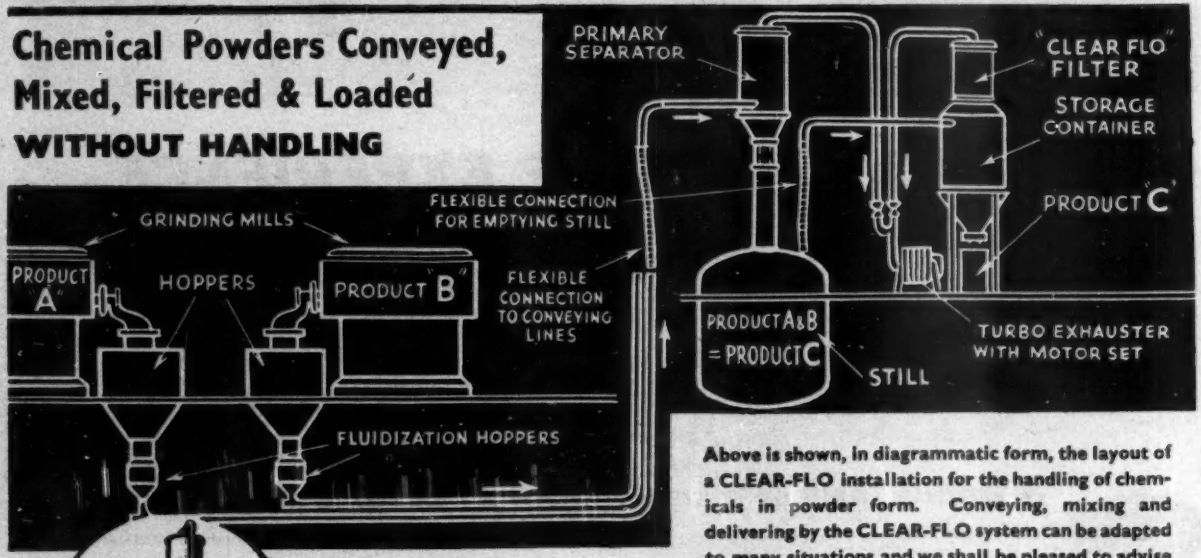
BERKLEY STREET, BIRMINGHAM 1
Telephone: MIDland 3795/6/7. Cables: Finhyd Birmingham 1

In association with FAWCETT PRESTON & CO. LTD., BROMBOROUGH, CHESHIRE, and FINNEY PRESSES LTD., BIRMINGHAM 1.

FF/13B.

CHEMICAL CONVEYING SIMPLIFIED

Chemical Powders Conveyed, Mixed, Filtered & Loaded WITHOUT HANDLING



(On left) 15 h.p. Standard CLEAR-FLO Pneumatic Conveying Unit

Above is shown, in diagrammatic form, the layout of a CLEAR-FLO installation for the handling of chemicals in powder form. Conveying, mixing and delivering by the CLEAR-FLO system can be adapted to many situations and we shall be pleased to advise upon your own particular requirements.

Your enquiries are invited

BIVAC AIR COMPANY LTD.

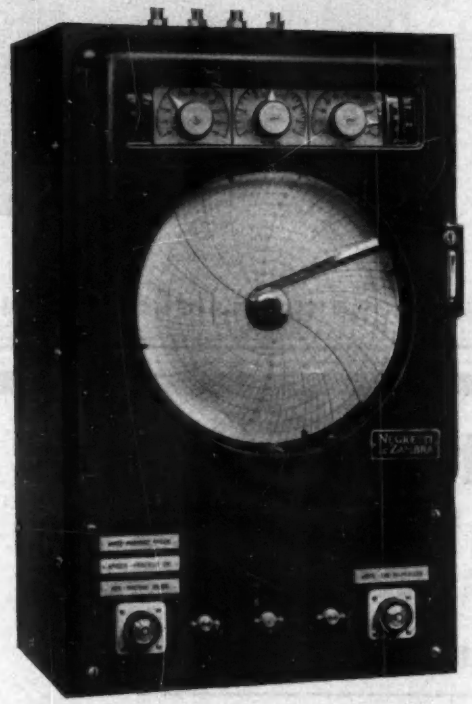
PORTWOOD, STOCKPORT, CHESHIRE Tel.: STOckport 3468/9

PNEUTECHNIQUE

gives you push-button programme control and recording for four types of programme

Here is control which can be applied to processes where temperature variations must be accurately timed and held. Here is simple push-button control, and visual indication of the current stage of the process.

Standardised pneumatic components are arranged in circuit to form an automatic pro-



gramme recorder controller. There are no cams and there is no capillary tubing, for temperature measurement is carried out by a highly sensitive air-operated force-balance type Temperature Transmitter. Adjustment and servicing are simplified.

FOUR TYPES OF PROGRAMME, each obtainable by means of four controls:

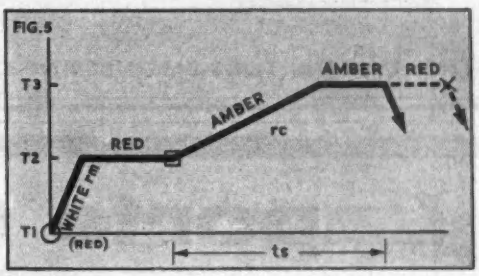
Minimum Process Temperature Setting . . .

Required Rate of Temperature Rise Setting . . .

Maximum Process Temperature Setting . . .

Total Process Time Setting.

These controls are infinitely variable within the limit of operation. Programme selection and initiation is by push-button operation. Progress is indicated through all stages by means of multi-coloured indicator lamps.



GRAPH shows five temperature changes with corresponding light indicators: (1) Maximum rate of rise to minimum process temperature, when (2) process may be held until (3) controlled rate of rise to maximum is required. (4) Temperature is held until automatic or push-button shut down.

May we send you copies of fully illustrated descriptive booklets T 39/1 and R 36?

NEGRETTI & ZAMBRA

NEGRETTI & ZAMBRA LTD.,
122 REGENT ST., LONDON, W.1 REGent 3406

FANS FOR CORROSIVE GAS

Designed Specially for Corrosive Fumes

No Rubbing or Bearing Surfaces

No Gas Leakage

Homogenous, Fully Corrosion-Resistant Materials Used Throughout

Write for leaflet 283

24" Keebush Axial Flow Fan

The handling of Corrosive liquids and gases is but one facet of Kestner's activities. Complete process plants are supplied for the production of chemicals, foodstuffs, etc. Write for leaflet No. 282A.

KESTNER EVAPORATOR & ENGINEERING CO. LTD. · 5 GROSVENOR GARDENS · LONDON S.W.1

Laporte Chemicals for Industry

Hydrogen Peroxide

Sodium Perborate

Organic Peroxy Compounds

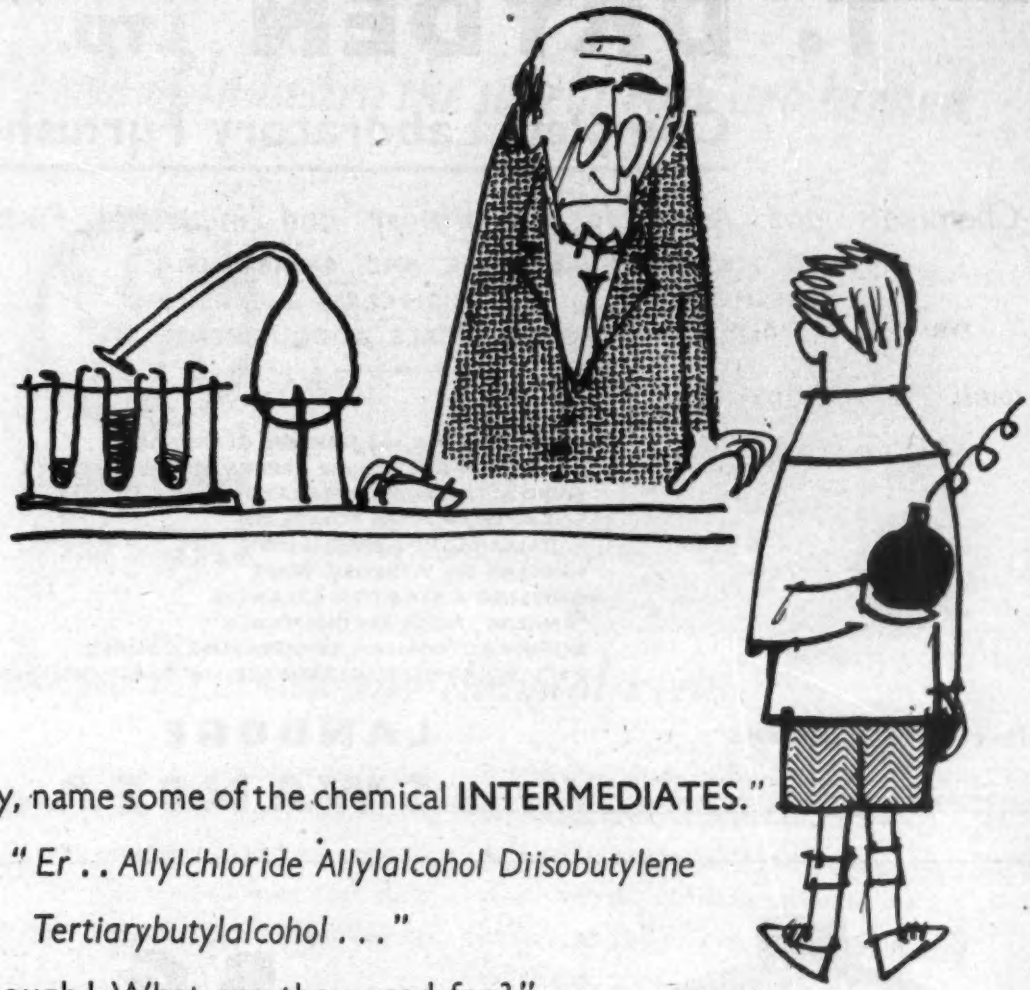
Barium Compounds

Sodium Sulphide

Detergents

LAPORTE

Laporte Chemicals Ltd., Luton. Telephone: Luton 4390. Telegrams: Laporte, Luton.



"Boy, name some of the chemical **INTERMEDIATES.**"

"Er . . Allylchloride Allylalcohol Diisobutylene Tertiarybutylalcohol . . ."

"Enough! What are they used for?"

"Sir! I have no idea. For information of that nature I would communicate with one of the biggest manufacturers . . .

SHELL CHEMICALS

SHELL

SHELL CHEMICAL COMPANY LIMITED
15-17, Gt. Marlborough Street, London, W.1. Tel.: GERrard 0666.

Sales Offices:

LONDON : Norman House, 105-109 Strand, W.C.2. Tel.: TEMple Bar 4455.
MANCHESTER : 144-6, Deansgate. Tel.: Deansgate, 6451.
BIRMINGHAM : 14-20, Corporation Street, 2. Tel.: Midland 6954-8.
GLASGOW : 124, St. Vincent Street, C.2. Tel.: Glasgow Central 9561.
BELFAST : 35-37, Boyne Square. Tel.: Belfast 20081.
DUBLIN : 53, Middle Abbey Street. Tel.: Dublin 45775.

GC4

T. DRYDEN LTD.

Complete Laboratory Furnishers

Chemicals and Acids for Laboratory and Industrial Purposes

SCIENTIFIC GLASSWARE AND APPARATUS
THERMOMETERS HIGH-CLASS FURNISHING
PHOTOGRAPHIC CHEMICALS & EQUIPMENT

SOUTH WALES STOCKIST and DISTRIBUTOR OF

PYREX, MONAX and FIRMASIL GLASSWARE
WHATMAN, POSTLIP and GREENS' FILTER PAPERS
BAIRD & TATLOCK'S APPARATUS
ROYAL WORCESTER PORCELAIN
A. GALLENKAMP'S SPECIALITIES
FIRECLAY and VITREOSIL WARE
OERTLING & STANTON BALANCES
"ANALAR" ACIDS and CHEMICALS
BRITISH ROTOTHERM TEMPERATURE GAUGES
E-MIL VOLUMETRIC GLASSWARE and THERMOMETERS

Phone: SWANSEA 55844/5

LANDORE
SWANSEA

B.G.

GRINDING MILL

SIZES FROM 2 TONS TO 25 TONS PER HOUR
LOW CURRENT CONSUMPTION
SILENT OPERATION BY COMPRESSION & FRICTION
NO DUST—COMBINED DRYING
FINENESS UP TO 300 MESH

We can also supply:—
SULPHURIC ACID PLANT · ELECTROLYTIC CELLS
OXYHYDROLISERS

MORITZ
CHEMICAL ENGINEERING Co. LTD
204, Earls Court Road, London, S.W.5

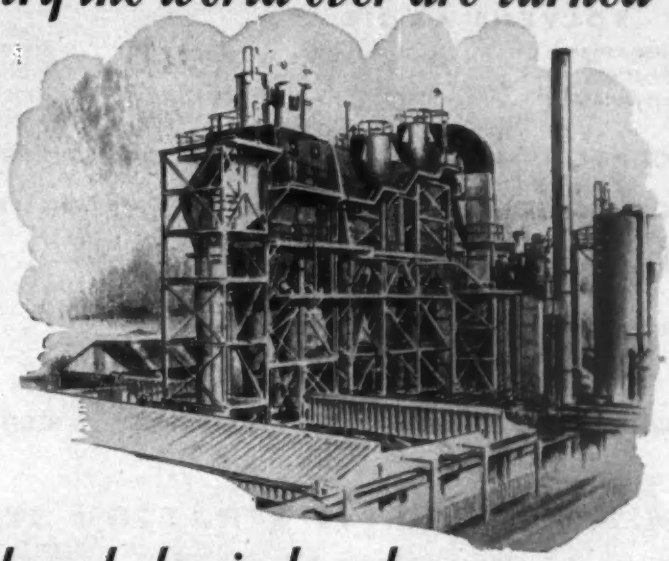
Telegrams: Morichemic, London. *Telephone: Frobisher 0769*

Wheels of industry the world over are turned

by

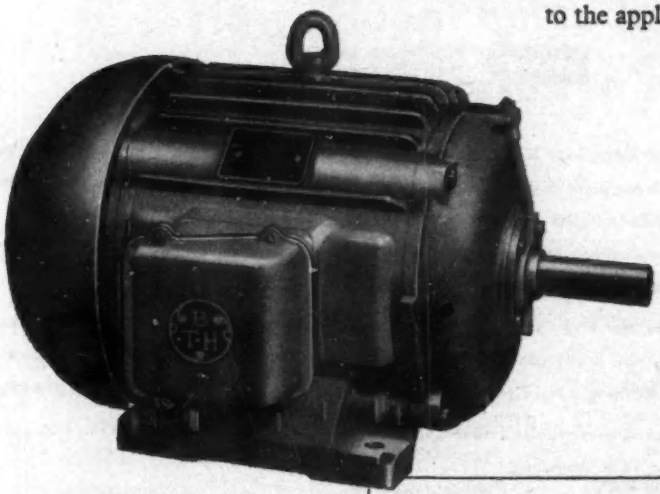
B T-H

ELECTRIC MOTORS



in the paint, varnish and chemical works

Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating and performance best suited to the application.



BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities.*

Member of the AEI group of companies

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

A4691

PETROLEUM-DERIVED AROMATIC SOLVENTS AND HYDROCARBON RESINS

SOLVENT AR-310

Boiling range	157-171°C.
Aromaticity	95%
Kauri Butanol	Above 90%

SOLVENT AR-395

Boiling range	212-272°C.
Aromaticity	98% by volume

OTHER CUTS AVAILABLE ON REQUEST, INCLUDING BOILING RANGES 177-211°C. & 232-285°C.

PETROLEUM-DERIVED HYDROCARBON RESINS

of high light stability and compatibility with other synthetic resins.

Softening point about 100°C. ASTM method.

ODOURLESS ALIPHATIC SOLVENT

thinner for odourless paints.
Boiling range about 175-210°C.

OTHER PRODUCTS CURRENTLY HANDLED IN BULK AND DRUMS INCLUDE:

N-BUTANOL · ISO-BUTANOL · BUTYL ACETATE · 2-ETHYL—4-METHYL PENTANOL · ETHYLENE GLYCOL

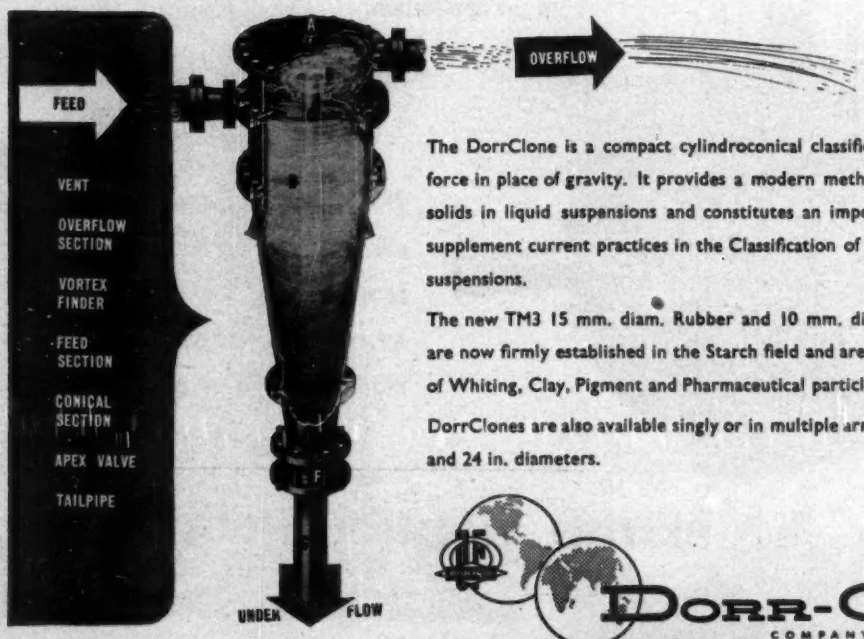
Enquiries to:

CHEMITRADE LTD., 17 STRATTON STREET, LONDON, W.1.

Telephone: GROsvenor 3422. Cables: Multikem, London.
Telex: London 28694 Traforchem

THE DORRCLONE

(Dutch State Mines Cyclone)



The DorrClone is a compact cylindroconical classification unit utilising centifrugal force in place of gravity. It provides a modern method of separating finely divided solids in liquid suspensions and constitutes an important new tool with which to supplement current practices in the Classification of crystalline and other granular suspensions.

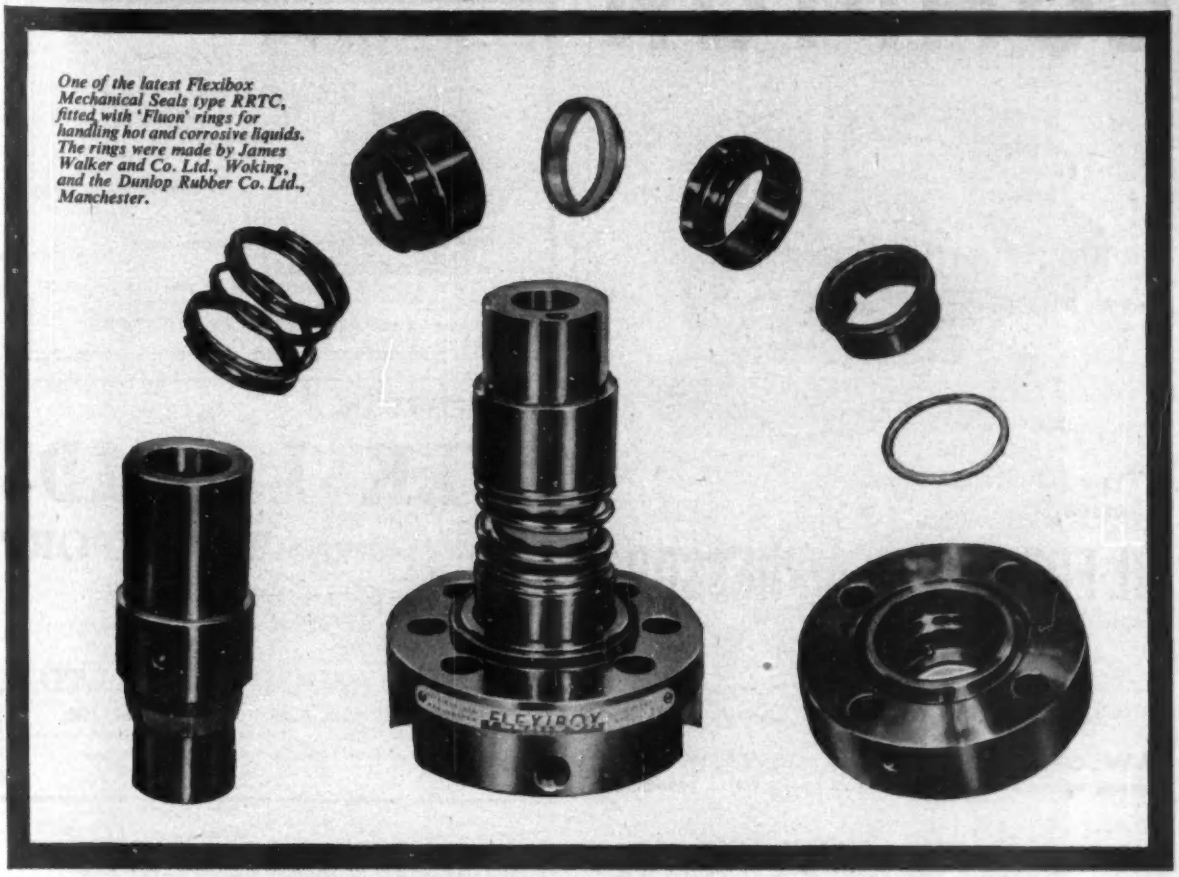
The new TM3 15 mm. diam. Rubber and 10 mm. diam. Bakelite multi-DorrClones are now firmly established in the Starch field and are finding use in the Classification of Whiting, Clay, Pigment and Pharmaceutical particles in the Submicron size range.

DorrClones are also available singly or in multiple arrangements in 3 in., 6 in., 12 in. and 24 in. diameters.

DORR-OLIVER COMPANY LIMITED

ABFORD HOUSE, WILTON ROAD, (VICTORIA), LONDON, S.W.1

'FLUON' *increases production in the Chemical Industry-No.1*



One of the latest Flexibox Mechanical Seals type RRTC, fitted with 'Fluon' rings for handling hot and corrosive liquids. The rings were made by James Walker and Co. Ltd., Woking, and the Dunlop Rubber Co. Ltd., Manchester.

How 'Fluon' helps to handle hot and corrosive liquids

ON SOME rotary shaft equipment in pumps, agitators, mixers, etc., special seals are needed to prevent leakage from the glands. They must be tough, able to stand up to the friction involved in the rotary motion; they must be flexible to ensure close fitting; and, when the liquids handled are highly corrosive, they must be made from materials which have exceptional properties of chemical resistance.

The new mechanical seal shown here is particularly efficient because it incorporates 'Fluon' polytetrafluoroethylene. 'Fluon' p.t.f.e. is the plastics material with the unique combination of properties. It is not only tough and flexible, with a remarkably low coefficient of friction; it is also unaffected by all known corrosives except a few fluorine compounds and molten alkali metals.

'Fluon' p.t.f.e. is chemically inert, has a non-stick surface and good impact strength. It has a very low permittivity and power factor. 'Fluon' has a working temperature ranging from −80°C. to 250°C.

The use of 'Fluon' on this mechanical seal is only one of the invaluable applications being found for 'Fluon' in the chemical industry.

'FLUON'

'Fluon' is the registered trade mark for the polytetrafluoroethylene manufactured by I.C.I.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

PF.31

PETROLEUM-DERIVED AROMATIC SOLVENTS AND HYDROCARBON RESINS

SOLVENT AR-310

Boiling range	157-171°C.
Aromaticity	95%
Kauri Butanol	Above 90%

SOLVENT AR-395

Boiling range	212-272°C.
Aromaticity	98% by volume

OTHER CUTS AVAILABLE ON REQUEST, INCLUDING BOILING RANGES 177-211°C. & 232-285°C.

PETROLEUM-DERIVED HYDROCARBON RESINS

of high light stability and compatibility with other synthetic resins.

Softening point about 100°C. ASTM method.

ODOURLESS ALIPHATIC SOLVENT

thinner for odourless paints.
Boiling range about 175-210°C.

OTHER PRODUCTS CURRENTLY HANDLED IN BULK AND DRUMS INCLUDE:

N-BUTANOL · ISO-BUTANOL · BUTYL ACETATE · 2-ETHYL—4-METHYL PENTANOL · ETHYLENE GLYCOL

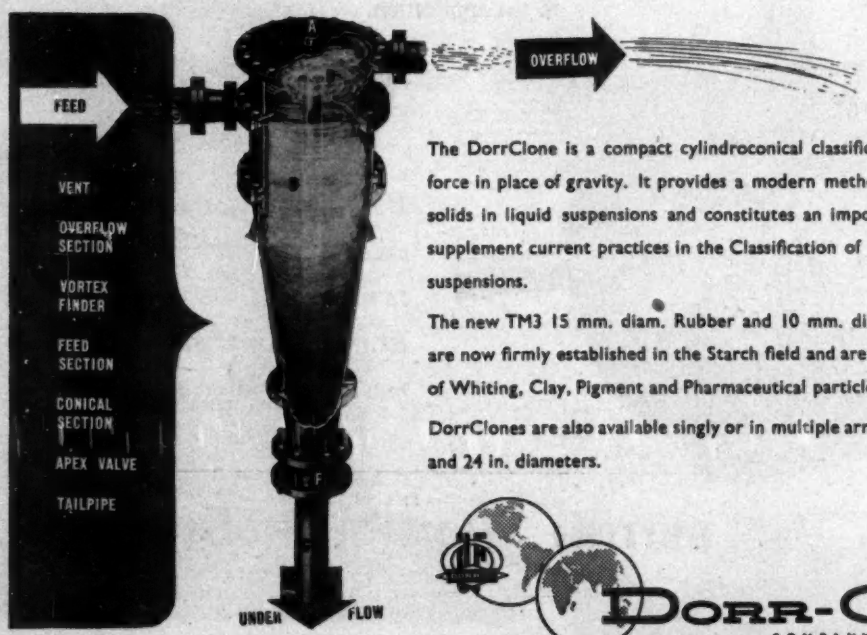
Enquiries to:

CHEMITRADE LTD., 17 STRATTON STREET, LONDON, W.1.

Telephone: GROsvenor 3422. Cables: Multikem, London.
Telex: London 28694 Traforchem

THE DORRCLONE

(Dutch State Mines Cyclone)



The DorrClone is a compact cylindroconical classification unit utilising centifrugal force in place of gravity. It provides a modern method of separating finely divided solids in liquid suspensions and constitutes an important new tool with which to supplement current practices in the Classification of crystalline and other granular suspensions.

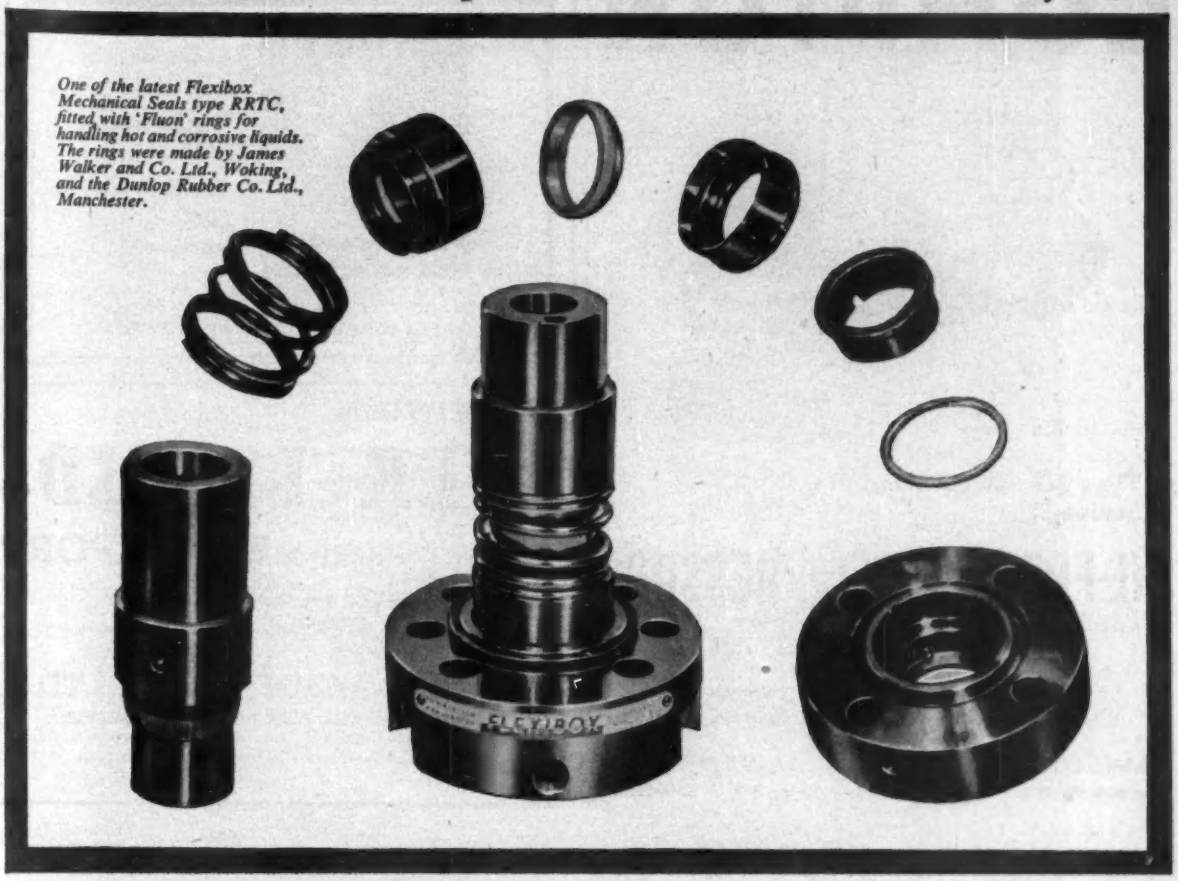
The new TM3 15 mm. diam. Rubber and 10 mm. diam. Bakelite multi-DorrClones are now firmly established in the Starch field and are finding use in the Classification of Whiting, Clay, Pigment and Pharmaceutical particles in the Submicron size range.

DorrClones are also available singly or in multiple arrangements in 3 in., 6 in., 12 in. and 24 in. diameters.

DORR-OLIVER COMPANY LIMITED

ABFORD HOUSE, WILTON ROAD, (VICTORIA), LONDON, S.W.1

'FLUON' *increases production in the Chemical Industry-No. 1*



One of the latest Flexibox Mechanical Seals type RRTC, fitted with 'Fluon' rings for handling hot and corrosive liquids. The rings were made by James Walker and Co. Ltd., Woking, and the Dunlop Rubber Co. Ltd., Manchester.

How 'Fluon' helps to handle hot and corrosive liquids

ON SOME rotary shaft equipment in pumps, agitators, mixers, etc., special seals are needed to prevent leakage from the glands. They must be tough, able to stand up to the friction involved in the rotary motion; they must be flexible to ensure close fitting; and, when the liquids handled are highly corrosive, they must be made from materials which have exceptional properties of chemical resistance.

The new mechanical seal shown here is particularly efficient because it incorporates 'Fluon' polytetrafluoroethylene. 'Fluon' p.t.f.e. is the plastics material with the unique combination of properties. It is not only tough and flexible, with a remarkably low coefficient of friction; it is also unaffected by all known corrosives except a few fluorine compounds and molten alkali metals.

'Fluon' p.t.f.e. is chemically inert, has a non-stick surface and good impact strength. It has a very low permittivity and power factor. 'Fluon' has a working temperature ranging from −80°C. to 250°C.

The use of 'Fluon' on this mechanical seal is only one of the invaluable applications being found for 'Fluon' in the chemical industry.

'FLUON'

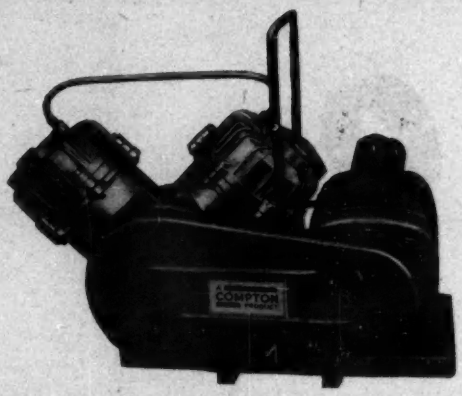
'Fluon' is the registered trade mark for the polytetrafluoroethylene manufactured by I.C.I.

ICI

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

PF.31

COMPTON



Type 2D and 2D-625
Series 2

OIL-FREE AIR COMPRESSORS

These machines give an absolutely oil-free output and are therefore suitable for many industrial purposes where contamination by lubricating oil cannot be tolerated.

DAWSON McDONALD & DAWSON LTD.
COMPTON WORKS · ASHBOURNE — Phone 113 — DERBYSHIRE

CARBOYS · PACKED CARBOYS
CARBOY TILTERS AND BARROWS
SAFETY CRATES TOP PROTECTORS

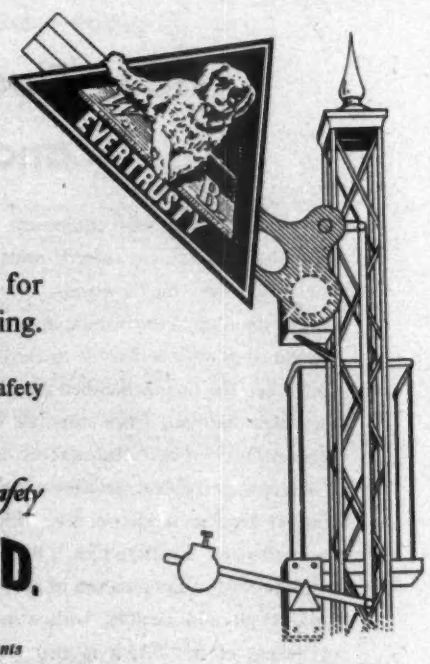
SPECIALISTS IN

BULK LIQUIDS TRANSPORT

ACIDS · OILS · SPIRITS
AND GENERAL CHEMICALS

HAROLD WOOD & SONS LTD.
Wormald St. · Heckmondwike
Tel.: Heckmondwike 1011/5 Telegraph: 'Transpert' Heckmondwike
Temporary London Area Office: Foundry Cottage, Orsett, Grays.
Tel.: Orsett 473

The Go-ahead Signal for SAFETY



Be on the right lines. Train your men to ask for "Evertrusty" first class Gloves and Protective Clothing.

The complete "EVERTRUSTY" range includes gloves and safety equipment to suit every industrial requirement.

Specialists in Industrial Safety

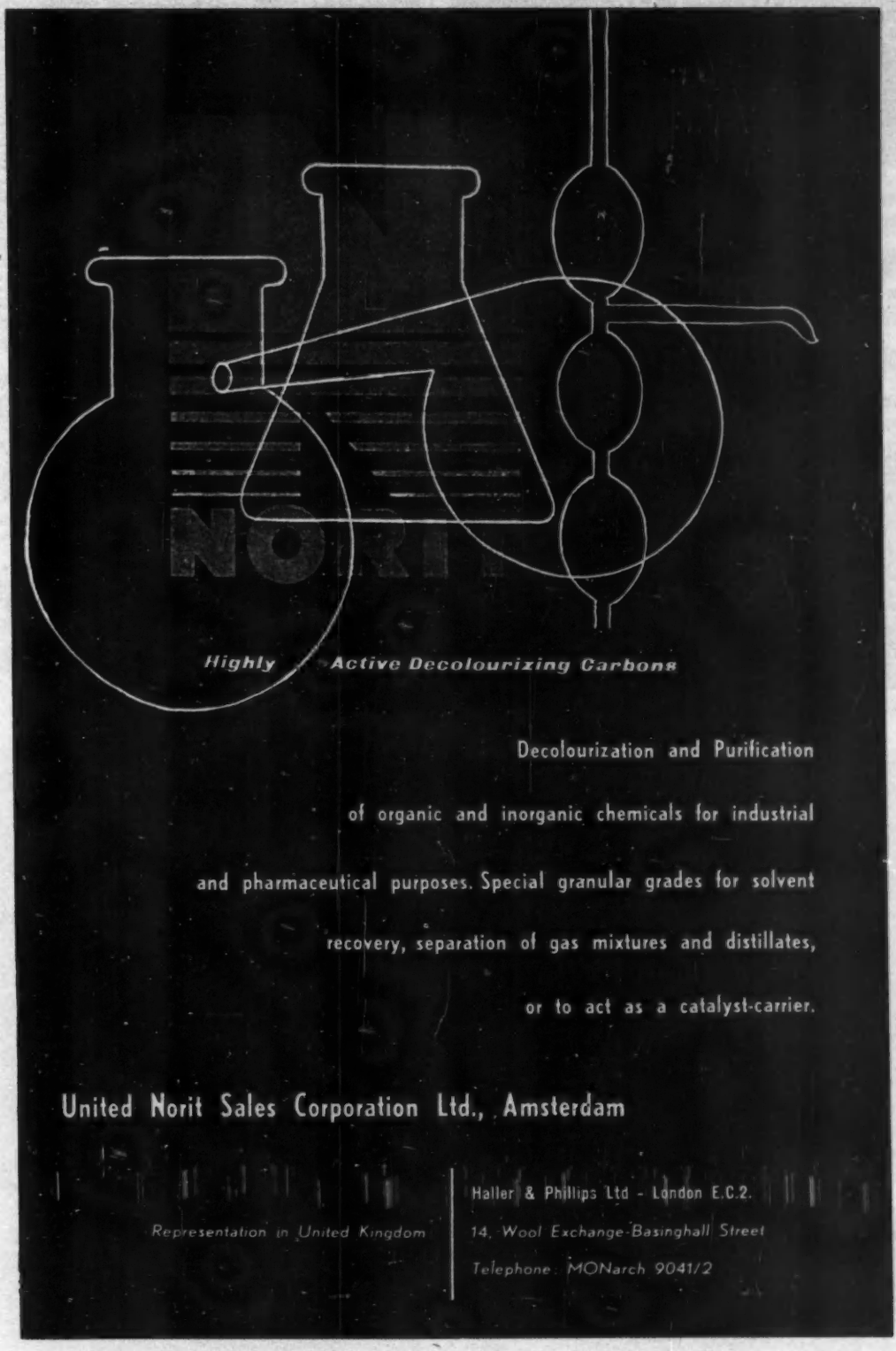
WALLACH BROS. LTD.

For over 70 Years

EVERTRUSTY

Members of the Royal Society for the Prevention of Accidents

49 TABERNACLE STREET, LONDON, E.C.2. Telephone: CLErkenwell 1448/9 Telegrams: Hammerman, Ave, London


NORIT
Highly Active Decolourizing Carbons
Decolourization and Purification
of organic and inorganic chemicals for industrial
and pharmaceutical purposes. Special granular grades for solvent
recovery, separation of gas mixtures and distillates,
or to act as a catalyst-carrier.
United Norit Sales Corporation Ltd., Amsterdam
Representation in United Kingdom
Haller & Phillips Ltd - London E.C.2.
14, Wool Exchange-Basinghall Street
Telephone: MONarch 9041/2

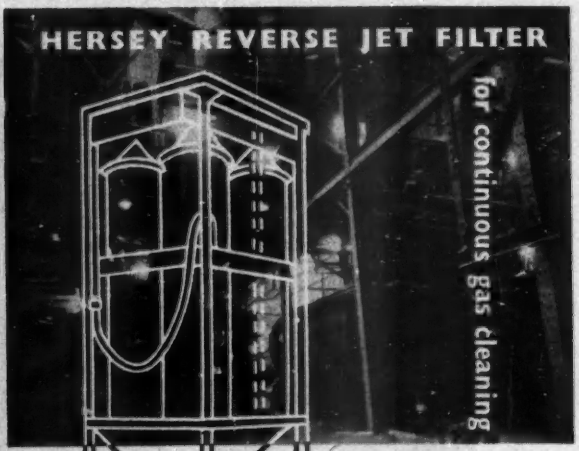
INDUSTRIAL CHEMICALS

SODIUM ARSENATE
CERIUM FLUORIDE
ARSENIC ACID
CERIUM OXIDE
METALLIC ARSENIC
CERIUM CHLORIDE
WHITE ARSENIC
THORIUM OXIDE
VANADIUM
RARE EARTHS

CONTACT
EMCER PRODUCTS LTD
22 • MARSHGATE LANE
STRATFORD E.15
TELEPHONE
MARYLAND • 4577
CABLES
EMCERPROD
LONDON

HOME EXPORT

HERSEY REVERSE JET FILTER

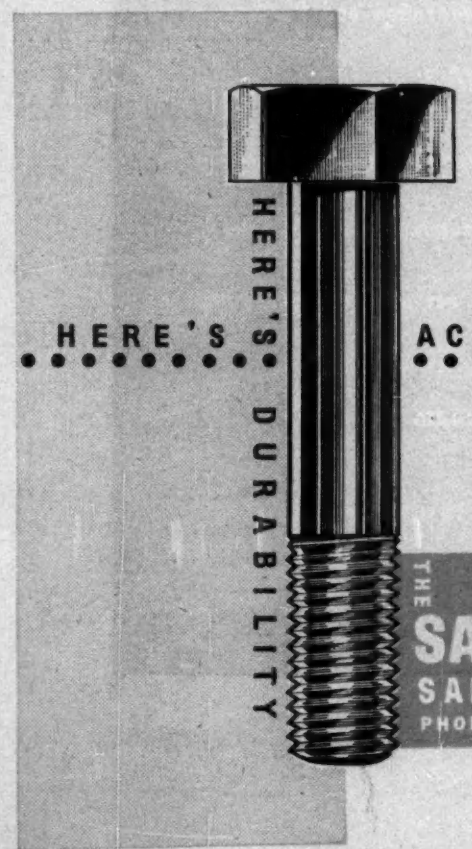


CECA

- **POSITIVE** filtration by particle impingement, 99.9 plus dust arrest.
- Lower maintenance costs.
- Higher filter speeds, unusually compact.
- Continuous performance —no air flow variation.
- **NEW** reverse Jet cleaning—no rapping, no blow-back.

THE BRITISH CECA COMPANY LTD., 175 Piccadilly, London, W.1
Tel: HYDE PARK 5131 Cables: ACTICARBON, LONDON

For more information use Enquiry Form—**CP Ref. 000.**



STAINLESS STEEL
BOLTS · NUTS · STUDS
ACID AND HEAT RESISTING

We are specialists in the manufacture of Bolts, Nuts, Studs and Machined Parts in all classes of Heat-Resisting and Stainless Steels.

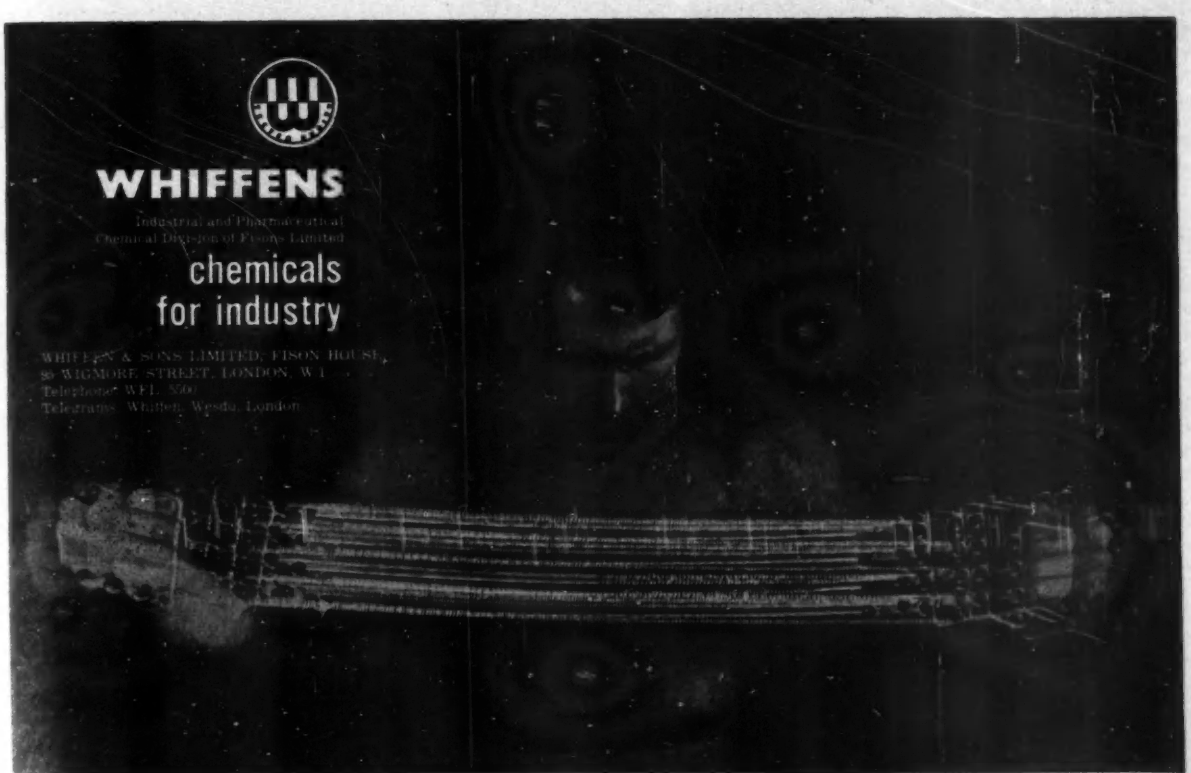
THE **SANDIACRE SCREW Co LTD**
SANDIACRE • NEAR NOTTINGHAM
PHONE · SANDIACRE 2065/6 • GRAMS · SCREWS, SANDIACRE

All products are machined from bar materials.

is your business expanding?

It is often and truly said that plastics have opened up a world of commerce. With equal certainty, the Genitrons have 'opened up' a world of plastics. Plastics, and both natural and synthetic rubbers, of all types may be expanded to controlled limits by means of Genitron Blowing Agents.

Whiffens have technical literature concerning the Genitron range, including the new Genitron N—a special formulation for epoxy resins. They also offer a very fine technical service. Both literature and technical service are freely available to those who wish to review their present products and future developments in terms of the Genitrons.


WHIFFENS
Industrial and Pharmaceutical Chemical Division of Fisons Limited
chemicals for industry
WHIFFEN & SONS LIMITED, FISON HOUSE, 89 WIGMORE STREET, LONDON, W.1
Telephone: WEL. 5500
Telegrams: Whiffen, Wesdo, London

W20

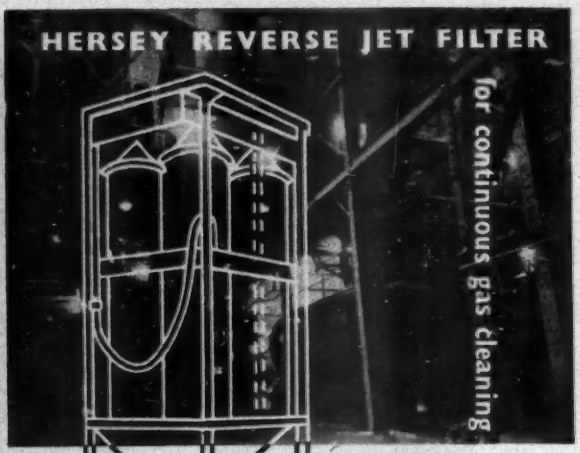
INDUSTRIAL CHEMICALS

SODIUM ARSENATE
CERIUM FLUORIDE
ARSENIC ACID
CERIUM OXIDE
METALLIC ARSENIC
CERIUM CHLORIDE
WHITE ARSENIC
THORIUM OXIDE
VANADIUM
RARE EARTHS

CONTACT
EMCER PRODUCTS LTD
22 • MARSHGATE LANE
STRATFORD E.15
TELEPHONE
MARYLAND • 4577
CABLES
EMCERPROD
LONDON

HOME EXPORT

HERSEY REVERSE JET FILTER

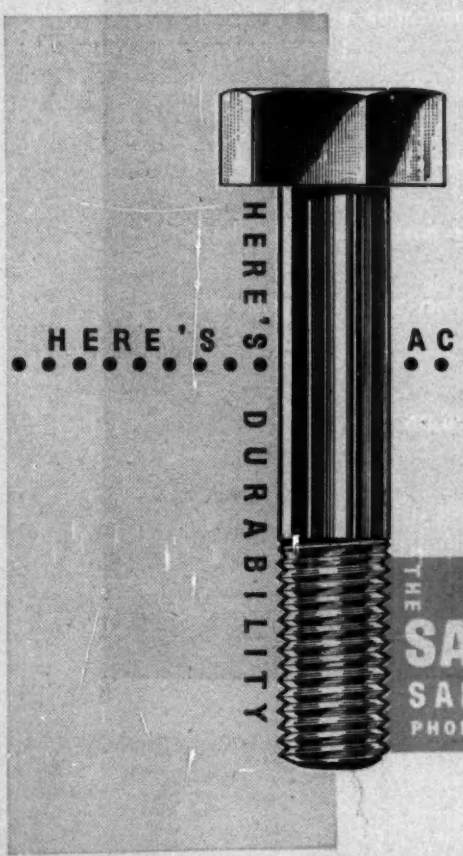


CECA

- **POSITIVE** filtration by particle impingement, 99.9 plus dust arrest.
- Lower maintenance costs.
- Higher filter speeds, unusually compact.
- Continuous performance —no air flow variation.
- **NEW** reverse Jet cleaning—no rapping, no blow-back.

THE BRITISH CECA COMPANY LTD., 175 Piccadilly, London, W.1
Tel: HYDE PARK 5131 Cables: ACTICARBON, LONDON

For more information use Enquiry Form—**CP Ref. 000.**



HERE'S ACCURACY

STAINLESS STEEL
BOLTS · NUTS · STUDS
ACID AND HEAT RESISTING

We are specialists in the manufacture of Bolts, Nuts, Studs and Machined Parts in all classes of Heat-Resisting and Stainless Steels.

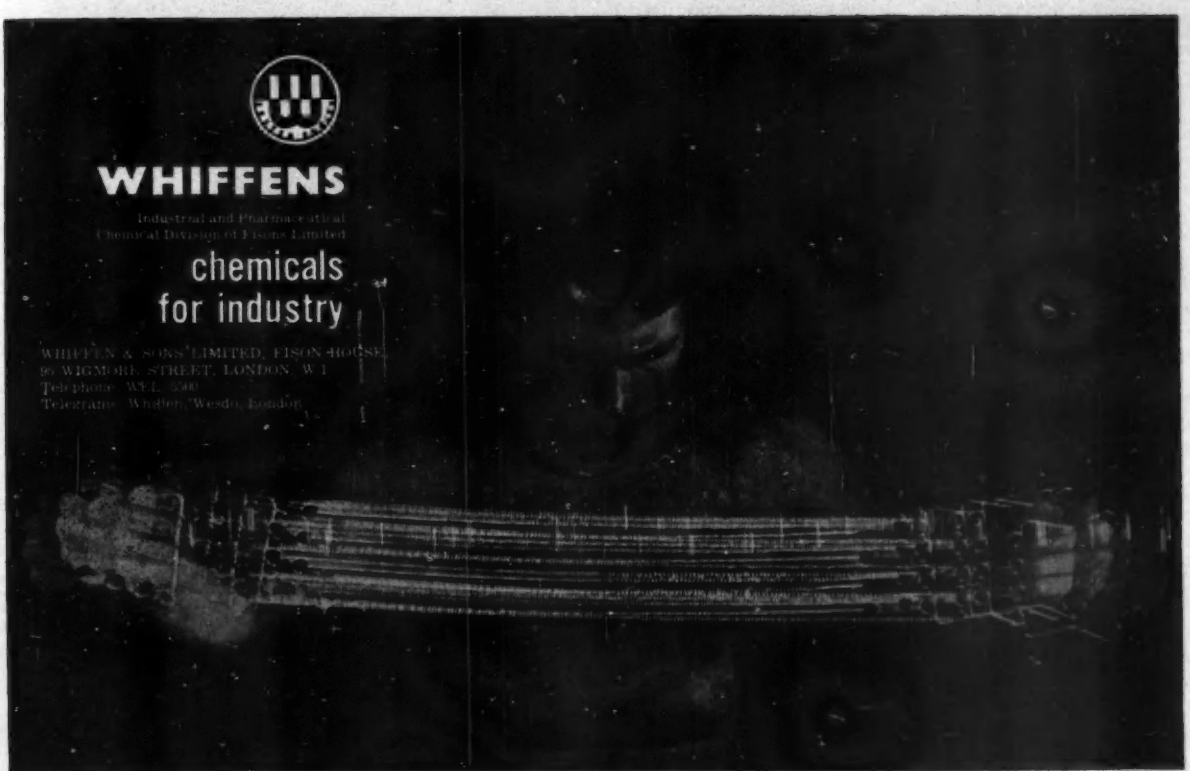
THE SANDIACRE SCREW Co LTD
SANDIACRE • NEAR NOTTINGHAM
PHONE · SANDIACRE 2065/6 • GRAMS · SCREWS, SANDIACRE

All products are machined from bar materials.

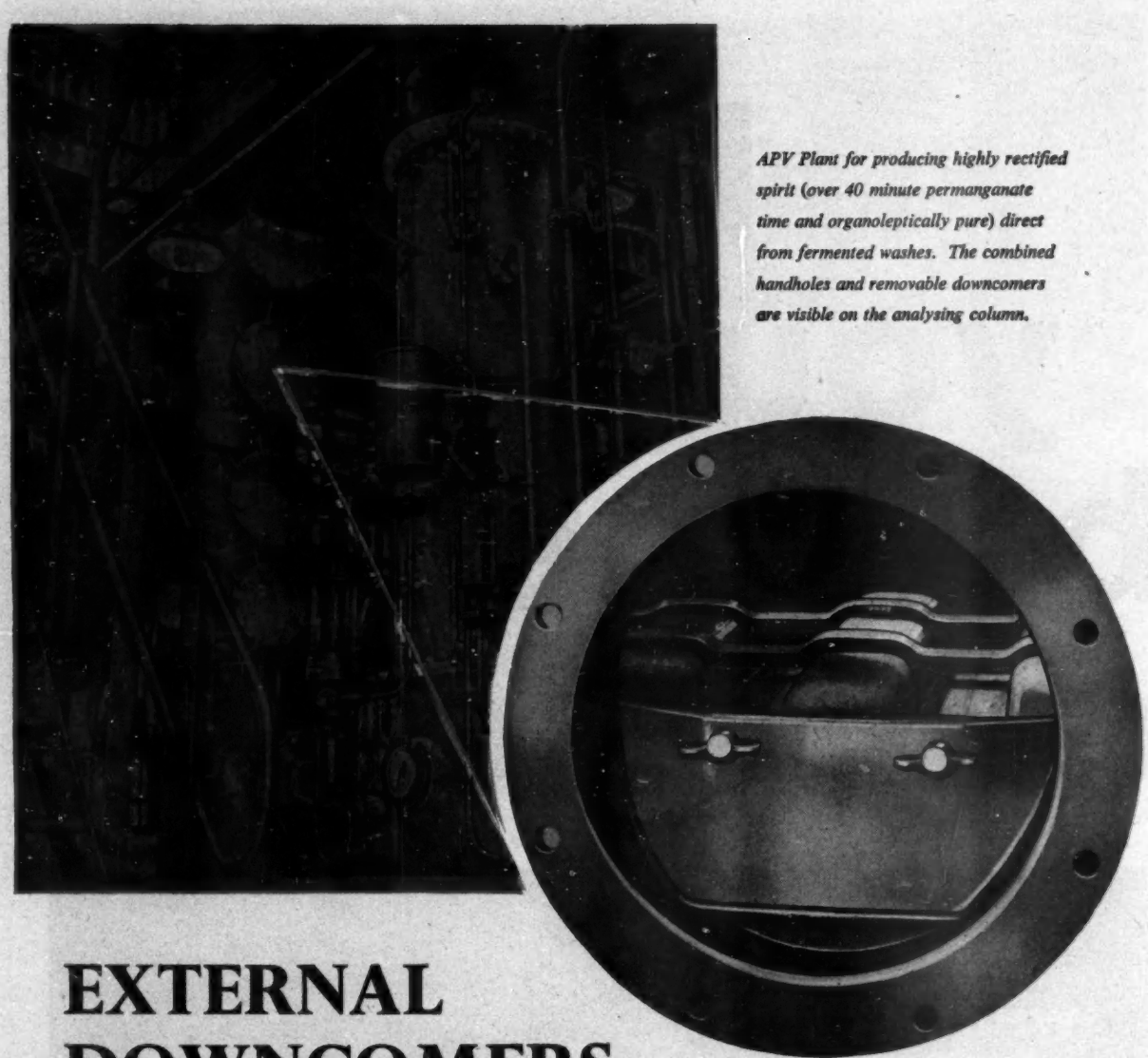
is your business expanding

It is often and truly said that plastics have opened up a world of commerce. With equal certainty, the Genitrons have 'opened up' a world of plastics. Plastics, and both natural and synthetic rubbers, of all types may be expanded to controlled limits by means of Genitron Blowing Agents.

Whiffens have technical literature concerning the Genitron range, including the new Genitron N—a special formulation for epoxy resins. They also offer a very fine technical service. Both literature and technical service are freely available to those who wish to review their present products and future developments in terms of the Genitrons.



W20



APV Plant for producing highly rectified spirit (over 40 minute permanganate time and organoleptically pure) direct from fermented washes. The combined handholes and removable downcomers are visible on the analysing column.

EXTERNAL DOWNCOMERS

–a refinement in Alcohol Plant design

THE DISTILLATION of fermented washes is often associated with a heavy deposition of sludge within the analysing column. In order to prevent frequent dismantling, APV columns are equipped with combined handholes and removable downcomers —one of many refinements to be incorporated in APV alcohol plants.

APV *CHEMICAL ENGINEERING DIVISION*

Wandsworth Park, London, S.W.18

Plant for: SACCHARIFICATION, FERMENTATION AND THE DISTILLATION OF INDUSTRIAL, RECTIFIED, EXTRA NEUTRAL AND ABSOLUTE ALCOHOLS, ACETONE, ACETIC ACID, BUTYL ALCOHOL.

VOL. 78 No. 1992
14 SEPTEMBER 1957

Telephone: FLEet Street 3212 (26 Lines)
Telegrams: Allangas · Fleet · London

Editor M. C. HYDE
Manager H. A. WILLMOTT
Director N. B. LIVINGSTONE WALLACE

Midlands Office
Daimler House, Paradise Street, Birmingham. [*Midland* 0784-5]

Leeds Office
Martins Bank Chambers, Park Row, Leeds 1. [*Leeds* 22601]

Scottish Office
116 Hope Street, Glasgow, C2. [*Central* 3954-5]

IN THIS ISSUE

Semiconductor Research	400
Research at Long Ashton	400
BSI Annual Report	401
New British Standards	402
Radioisotopes Conference in Paris	402
Growth of UK Aerosol Industry	403
Distillates	404
New Water Purification Process	405
British Association Annual Meeting	406
An 'Enforced Order' Mixer	407
Pharmaceutical Conference	409
US Import Changes	410
Overseas News	411
For Your Diary	412
Chemical Pioneers	413
Chemist's Bookshelf	414
Engineering Exhibition	416
People in the News	417
Obituary	417
Commercial News	418
Market Reports	419
Chemical Stocks and Shares	419
New Patents	420

Annual subscription is 52s 6d ($7.40), single copies 1s 3d (by post 1s 6d).

CHEMICAL AGE

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

PRODUCTIVITY AND WAGES

RECENTLY the Minister of Labour stated in the House of Commons that wages should be linked to productivity. Similarly, in the US President Eisenhower indicated that wage increases must be 'reasonably related to improvements in productivity' if they were not to be inflationary.

In nearly all company reports, mention is made of rising costs, increased wages and better outputs, but less profits. Since the Government's request just over a year ago to keep prices stable wherever possible, the chemical industry has without doubt tried hard and in many instances has not increased chemical prices throughout this period.

The greater productivity in the chemical industry, due in no small measure to new plant and equipment, has helped to hold prices of chemical products steady. But wages have risen and are continuing to rise. Figures compiled for US process industries suggest that wages have been rising there by annual increments averaging nearly 20 per cent greater than the corresponding gain in productivity. In fact, if chemical wages were linked to productivity gains, the US chemical industry's wage costs would have risen only 26 per cent instead of the 71 per cent actual increase.

The productivity-wage relationship is a difficult one to estimate. It is especially difficult in the chemical industry. Like chemical companies' research expenditure, productivity statistics are also difficult to determine. Reasons advanced for this are too many products involved; items that are valuable by-products; frequent year-to-year changes in type, grade, concentration, and proportion of products; variation in plants, processes and production schedules.

As far as can be ascertained those large chemical manufacturers who compute productivity data for Government statistics produce such widely divergent figures that these are of no value for individual companies and plants. Factors concerned are different operating conditions by the companies in question, varied average productivity on the part of the workers, productivity estimated by concentrating on the same principal products over a period of years as against new products.

Probably most chemical companies who attempt to keep productivity records do so by using unit production cost and other control figures, particularly to estimate the value of investments such as new plant and equipment. Individual productivity data are not considered to justify the time and effort required in obtaining them.

The majority of chemical manufacturers readily agree that from the accounts point of view, it is virtually impossible to apportion accurately to individual products the man-hours, direct and indirect, involved in labour for power production, maintenance, etc., especially in cases where there is joint manufacture or a large chemical complex.

Plants making only a few products sometimes carry out productivity studies to check on supervisory efficiency in utilisation of machinery and manpower.

Productivity increases can be credited to the working man, but since the chemical industry has increased its capital facilities since the war years and yet has not greatly increased its labour force, it is suggested that research, improved tools and skill bring about greater production.

It has been asked whether companies link wages to productivity. There is good

reason for believing that some do take productivity records into consideration in determining wage adjustments. It is probably correct to say that productivity is not a major consideration in wage determinations but it is nevertheless one of several factors. That it is easier to obtain wage increases in an industry with a rapidly increasing productivity is a reasonable assumption, just as it is that an industry with poor productivity resists wage increases.

Obviously where worker productivity can be calculated without too much uncertainty, it has its uses, particularly for the economist. But for the chemical industry it has been suggested that 'corporate production', i.e. earnings per share, is understood by all.

SEMICONDUCTOR RESEARCH

MOST of the semiconductor devices now on the market have been made from single-element materials, principally germanium and silicon, the former being most useful for its high frequency properties and silicon having the advantage of greater efficiency at higher temperatures. Future progress, it is considered, appears to depend on learning more about compounds. In all semiconductor research a major problem has been that of achieving extremely pure materials. This very high degree of purity becomes even more difficult when more than one element is involved.

Two US developments in this field are of interest. A silicon carbide rectifier has been produced by the General Electric Research Laboratory which has been operated at temperatures up to 1,200°F. Similar devices made with other materials, notably silicon, have only been able to operate at temperatures of up to 400–500°F. This silicon carbide rectifier is still in the laboratory development stage. Its practical future in rectifiers and other solid-state devices will depend, of course, on progress in the preparation of this material.

From the David Sarnoff Research Centre of the Radio Corporation of America, Princeton, N.J., the experimental use of new compound semiconductors in place of germanium and silicon is reported. This work has led to laboratory types of transistors and diodides that can operate efficiently over a broad range of frequencies at temperatures as high as 850°F. —some 300° hotter than the maximum for present types.

Efforts to combine in a single material the best features of germanium and silicon have now resulted in new experimental devices employing various compound materials, notably gallium arsenide, report RCA. Gallium arsenide microware mixer and rectifier diodides of the point contact type are stated to have already yielded promising results compared with the equivalent germanium and silicon units. Substantial sample quantities have been made in the laboratory of gallium arsenide microware diodides capable of operation at radar frequencies in temperature environments well above the maximum for silicon units.

Devices operating in the higher temperature ranga are likely to have applications in electronic equipment for ultra-high-speed aircraft approaching the thermal barrier and in further miniaturisation of computors and other systems in which special cooling arrangements are now required.

LONG ASHTON RESEARCH

PUBLICATION of the 1956 annual report of Long Ashton Research Station, University of Bristol, (price 15s. from the secretary) almost coincides with the retirement of Professor T. Wallace, director since 1943 and a member of the station's staff since 1919. In the field of plant nutrition, especially for fruit, Professor Wallace's continuous record of distinguished contributions is well known throughout the world. No one more than he fostered the study of the trace elements in this country, and the latter part of his career saw the establishment of the Agricultural Research Council's Unit for Micronutrient Studies at Long Ashton.

The research centre he went to immediately after World War 1 was small; the one he is leaving is a truly large centre, well recognised by governmental support and most effectively staffed. Professor Wallace has combined personal research skill and administrative capacity unusually successfully.

It is fitting that the 1956 report should contain so much of chemical interest, though the majority of it would have seemed incomprehensible in the earlier years of the director's own career. Field-work studies of iron chelates as foliage sprays and soil injections have shown this modern approach to iron deficiency to be effective. Conflicting plot evidence about strawberry plants' needs for phosphate has been produced, and new pot-culture experiments are being started to re-investigate this particular plant-nutrient relationship.

New substituted 2-naphthyloxyacetic acids have been synthesised for study as growth-regulating substances. Other synthetic work has shown that halogen substitution in the 2-napthol series gives compounds of promising fungistatic activity, and new derivatives of 8-hydroxyquinoline have also been studied. Wetting agents for improving leaf retention of copper fungicides have been re-investigated, and an important distinction between types of agent has been indicated, the anionic type giving much superior retention. Field work with resin-supplemented (polyvinyl compounds) copper fungicides has not shown this approach to potato blight or apple canker control to bring any better control.

Radioisotope studies have involved the use of P^{32}, Fe^{59}, Mo^{99} and C^{14}; extension of this research method to the field of micro-nutrients is of exceptional interest, and it has included studying the soil behaviour of new iron chelates.

A considerable number of the individual papers in the report deal with problems of spray application. Fundamental investigation of the factors influencing the disintegration of a fluid jet on leaving the spraying orifice has been started, while electronic flash photography is being used to study the movements of spray droplets on solid surfaces.

STEAM CONDENSERS

STEAM-CONDENSING plant would be more efficient if steam could be made to condense upon the cooling surfaces as separate drops and not as a thin film of water, which then acts as a heat insulator and slows down the rate of condensation. It is far from new knowledge that the presence of a water-repellent substance on such surfaces will induce condensation by drops, but the use of oils and fatty substances for this purpose has been handicapped by the fact that they are soon washed away by the steam itself; also, they may have undesirable effects elsewhere in the plant.

Joint research by the Mechanical Engineering Research Board (DSIR) and Queen Mary College is developing new chemicals which seem promisingly likely to solve this problem. These chemicals have not been named but they are complex organic compounds containing one or more water-repellent group : and an element with a high affinity for copper. Some 70 of them, all prepared at the college, have been tested, and all of them have promoted dropwise condensation in tests lasting at least 500 hours; one particular compound continued to promote dropwise condensation for five months. Exposure to air seems to be a risk to the effectiveness of the new substances, but some of them recover their power to promote drop condensation when steam removes the outer film of oxidised material. Tests on parts of the condenser tube system in a ship were successful, however, despite periods when the tubes were often open to the air. The treated parts of the tube surfaces were still giving dropwise condensation after 10 months' operation.

So far the chemicals prepared have been intended only for steam condensation on metal surfaces containing copper. Further work is in progress to develop other compounds to promote dropwise condensation on non-copper surfaces, and also to promote similar condensation of organic vapours on copper-containing surfaces.

BSI Annual Report Lists Standards Being Prepared

BS for Flame-Resistant Fabrics

AMONG new British Standards in course of preparation are standards covering flame-resistant fabrics, names for pesticides, the coining of common names for refrigerant chemicals, and standards for pressure vessels, synthetic resin and polyvinyl acetate adhesives, etc.

When the British Standards Institution recently issued its report on the flammability of apparel fabrics (see CHEMICAL AGE, 8 June, p. 972) the committee responsible recommended that a standard for durable flame-resistance of fabrics should be established and that goods offered for sale as such should be warranted and identified accordingly. Two draft standards which give effect to this recommendation are now being circulated for comment in industry. These are 'Methods of test for the flammability of apparel, household and furnishing fabrics' and 'Flame-resistant fabrics', which says what should be expected of any textile to which the term flame-resistant is applied.

A full account of work on standards now in course of preparation is contained in the 'Annual Report, 1956–57' of the Institution, which is available to non-members at a cost of 7s 6d from the BSI sales department at 2 Park Street, London W1.

Chemical Engineering: In the revision of BS 1500, (fusion-welded pressure vessels) attention is being given to steel materials. Data on copper alloy are being considered and data on aluminium alloys and nickel alloys are being collected with a view to establishing permissible design stresses.

Fine and Heavy Chemicals: The fine and the heavy chemicals industry standards committees have been combined and one committee now deals with standardisation policy for the whole industry. A committee has been set up in connection with the work being undertaken through ISO (International Organisation of Standardisation) on specifications for photographic chemicals. The first to be considered internationally are quinol, metol, potassium bromide, sodium carbonate, sodium sulphite and sodium thiosulphate, and the committee will eventually consider the preparation of British Standards for these materials.

It is hoped that the British Standard for barytes aggregates for concrete and plaster will be published shortly; its scope is likely to be wider than envisaged and is now expected to be of direct interest to the atomic energy industry for shielding purposes where dense concrete is used.

Oils, Fats and Greases: It is hoped, in collaboration with the American Oil Chemists' Society, to unify the two procedures for determining glycerol using sodium metaperiodate.

Plastics: As part of the programme of standards for plastics tubing, unplasticised p.v.c. tubing is now being studied and revision of the standards for polythene tubing continues.

Scientific Glassware, etc.: There has been close collaboration with ISO technical committee 48 in its studies on determining the chemical resistance of laboratory glassware. Final ISO methods of test for this purpose and for resistance to thermal shock, will in due course be considered for publication as British Standards. A new committee is being set up to prepare a standard on performance requirements for laboratory furnaces.

International: The ISO chemistry committee has approved draft proposals on methods of analysis for sulphuric acid, hydrochloric acid, anhydrous ammonia, ammonia solution, nitric acid, sodium carbonate, sodium hydroxide, potassium hydroxide, acetic acid, acetic anhydride, n-butanol, isopropyl alcohol and acetone, and for the determination of specific gravity, distillation range, residue on evaporation, water by the Karl Fischer method, and bromine index. New work has been started on methods of analysis for ammonium nitrate, sulphur, methanol, ethanol, formic acid and urea.

The ISO committee on aromatic hydrocarbons reports that principal criteria to serve as the bases of a draft proposal for xylenes have gone forward, with proposals for toluenes, benzoles and toluoles, as soon as agreement has been reached on test methods. France has been invited to convene a working group on terminology.

Work in Hand

The following is a summary of work in hand of interest to chemical engineers, the chemical industry and to chemists in general. New work is indicated by an asterisk*. Each stage of work in hand at 31 March 1957 is indicated by the figures 1 to 6 as follows: 1 work authorised; 2 drafting in hand; 3 draft circulated for comment; 4 comments under review; 5 approved for submission to industry standards committee; 6 approved for publication and with printer.

	Stage
CHEMICAL ENGINEERING	
*Acid resisting silicon iron pipes and fittings	3
Bricks and tiles (chem. resistant)	4
Electroplating:	
Cadmium anodes and cadmium salts	5
*Copper cyanide	5
*Copper sulphate	5
Valve outlets for compressed gas cylinders (revision BS 341)	2
Gas cylinders, filling ratio for liquefiable gases (revision BS 1736)	2
Dipped coatings of zinc and tin	2
Sprayed metal coatings	2
Methods of testing equipment to operate in vacuum	2
Pressure vessels:	
Fusion welded for chem. eng. (revision BS 1500)	3
Glass lined	1
Non-ferrous materials	1
Sizes for process vessels	4
Steel	5
*Steels for use at low temperatures	2
Powder properties:	
Glossary of terms	5
Test methods	2
Wire screening cloth (revision BS 481)	2
GAS INDUSTRY	
Flow measurement (revision BS 1042)	4
Temperature measurement (revision BS 1041)	2
Pressure gauges (revision BS 1780)	2
IRON AND STEEL	
Methods for analysis of iron and steel	1
*Methods for sampling and analysis of ores	2
NON-FERROUS METALS	
Sampling and analysis:	
Tin and alloys	2
SOLID FUEL	
Atmospheric pollution (sulphur dioxide determination)	1
CEMENT	
High alumina cement (revision BS 915)	2
Sulphate resisting cement	1
FIRE STANDARDS	
Chemical fire extinguishers (revision BS 138, 740, 1382 and 1271. Work includes use of plastics linings)	2
BUILDING	
Silicon-based water repellents for masonry	2
ADHESIVES	
Sampling and testing gelatines (revision BS 757)	2
Testing glues (revision BS 647)	2
Polyvinyl acetate adhesives for use with wood	2
Synthetic resin adhesives for low density timbers	2
DAIRY PRODUCTS	
Chemical analysis of:	
Cream	2
Imitation cream	2
Liquid milk (revision BS 1741)	1
DISINFECTANTS	
nvestigation of methods of test for disinfectants	2
FINE AND HEAVY CHEMICALS	
Acetylene generators, l.p. liquid sealed	2
*Antifreeze solutions	2
Barytes aggregates for concrete and plaster	4
Carbon tetrachloride (revision BS 575)	3
*Colouring matter for foodstuffs	1
*Common names for chemical refrigerants	2
Diacetin (glyceryl diacetate) (revision BS 1594)	2
Diethyl ether (revision BS 579)	4
Di-n-butyl phthalate (revision BS 573)	5
o-Dichlorobenzene	5
Formaldehyde solution	4
Methods of testing desiccants for use in dynamic equipment	2
Methanol (revision BS 506)	4
Paraformaldehyde	4
Sulphuric acid for lead-acid accumulators	2
*Tritolyl phosphate (revision BS 1999)	3
GLASS	
*Lead glass for X-ray purposes	1
*Observation glasses for pressure vessels	1
OILS, FATS AND GREASES	
*Methods of test for surface-active agents	1
PAPER	
Laboratory filter papers	2
*pH value of aqueous extracts of paper	4
PEST CONTROL	
Recommended common names for pest control products	2
PETROLEUM	
Test methods for determination of:	
*Flash point by the Abel apparatus	2
*Specific gravity	2
PIGMENTS, PAINTS AND VARNISHES	
*Camouflage colours (revision BS 987C)	2
Lac (revision BS 954)	2
Lac, bleached (revision BS 1284)	2
Aluminium priming paint for wood	2
Pigments:	
Methods of test	2
Colouring cement, etc. (revision BS 1014)	2
Red pigments (revision BS 333)	2
Water paints and distempers (revision BS 1053)	1
PLASTICS	
*Polystyrene moulding materials (revision BS 1493)	2
Polythene tube for:	
Cold water services (revision BS 1972)	2
General purpose (revision BS 1973)	2
*P.v.c. flooring	2
*P.v.c. tube (unplasticised)	1
RUBBER	
*Ebonite for general purposes	2
Glossary of terms	2
Methods of testing rubber and ebonite (revision BS 903)	2, 4
*Rubber closures for injectable fluids	2
Rubber hose, suction and discharge (revision BS 1102)	1
SCIENTIFIC GLASSWARE, ETC.	
*Conventional proportions and dimensions for drawings of laboratory glass apparatus	1
Density-composition tables:	
Caustic soda solutions (revision BS 824)	1
Sodium chloride solutions and calcium chloride solutions (revision BS 823)	1
Sulphuric acid solutions (revision BS 753)	2
*Desiccators (construction and safety requirements)	1
Laboratory pH meters	2
Microchemical apparatus (parts of BS 1428):	
Crucible holder microburners, spatulas and forceps	2
Micro-extraction apparatus	2
Unterzaucher apparatus (determination of oxygen)	2
Ovens, hot air sterilising	1
Laboratory furniture and fittings	4
Resistance of lab. glassware to thermal shock	2
Thermometers:	
Aspirated psychrometers	1
Cooling thermometer	3
*Meteorological (revision BS 692)	3
TAR PRODUCTS	
*Methods of sampling (revision BS 616)	1
*Pyridine	2

WOOD PRESERVATIVES

Method of test for the toxicity of wood preservatives to fungi (revision BS 838) 2
Organic solvent and water soluble types ... 1
Tar oil types, other than creosote 2

WATER ANALYSIS

Sampling of steam 2

RAYON

Glossary of fabrics containing man-made fibres ... 3

TEXTILE STEERING COMMITTEE

*Determination of resin finish 4
Methods of test for inflammability 4

DOCUMENTATION

Universal Decimal Classification Sections: Chemical technology (No. 66) 2

PACKAGING

Carbon black (packaging) 1
Glass vials 1

PROTECTIVE CLOTHING

*Protection against injurious radiation 2
*Safety helmets, industrial (revision BS 1651) ... 3

UNITS AND SYMBOLS

Glossary of terms used in high vacuum technology 4
Glossary of terms used in nuclear science ... 2

Standards Recently Published

THE following are details of British Standards recently published and available from the British Standards Institution at the prices stated:

Testing Vulcanised Rubber

THE LATEST publications available in the revising and issuing in separate parts of B.S. 903—'Methods of testing vulcanised rubber'—are Part C.4: Determination of electric strength of insulating soft vulcanised rubber and ebonite, and Part D.4: Determination of cross-breaking strength of ebonite.

Each part specifies the test pieces, apparatus, procedure and the method of calculating results.

PART C.4 specifies three methods: one-minute value, the step-by-step method (which gives results approximating to those of the one-minute value method) and the one-minute proof test.

PART D.4 also contains requirements for a proof test of cross-breaking strength of ebonite.

Copies parts C.4, price 3s and D.4, price 2s 6d, are obtainable from the British Standards Institution, Sales Branch, 2 Park Street, London W1.

Cadmium Anodes

LATEST addition to the series of British Standards dealing with electroplating (there are nine others in the series) is B.S. 2868: 1957 'Cadmium anodes and cadmium oxide for electroplating'.

Part 1 specifies requirements for the chemical composition of cadmium anodes. To determine the impurities in cadmium a spectrographic method is specified, as chemical methods are unsuitable.

Chemical composition, loss on ignition, and insoluble material and impurities is specified in Part 2. Spectrographic methods are laid down for the determination of impurities.

It is recommended that, wherever possible, British Standard laboratory glassware should be used when carrying out the tests.

Copies of both parts, under one cover, of this standard may be obtained from the British Standards Institution, 2 Park Street, London W1, price 3s.

Copper Cyanide

BS 2884 is the ninth and most recent publication in the series dealing with electroplating. The standard specifies the chemical composition of copper cyanide, and the amount of permissible impurities. Appendices lay down methods of determining copper, cyanide, iron, chloride and insoluble matter.

After pointing out the highly poisonous nature of copper cyanide, an appendix to the standard gives advice on its handling. It lists the symptoms of hydrocyanic acid and cyanide poisoning, and follows this with four 'First Aid' instructions.

The standard is obtainable from the BSI Sales Branch, price 4s 6d.

Borosilicate Glass

THE NEW British Standard BS 2649, has been prepared in collaboration with the Society of Glass Technology and recommends detailed procedures for determining the important constituents of the so-called borosilicate glasses.

Section one deals with the preparation of sample, reagents and apparatus, section two contains a number of analytical procedures and an appendix to the standard indicates the limits of error which may be expected when using the various procedures. Information is provided which will enable analysts to check their own methods on samples of the same glass as that used for the SGT investigations. Price 5s. from the BSI, Sales Branch.

Pest Control Chemicals

BRITISH STANDARD 1831 is a revision of a previous standard published in 1952 and 1953. It contains a total of 64 short coined common names which are recommended for easy identification of well-established pest control chemicals whose chemical names are long and cumbersome to pronounce. Four classes of pesticides are dealt with in BS 1831: insecticides, fungicides, herbicides and rodenticides.

Copies, price 7s 6d., from the BSI, Sales Branch.

AEA Seeks Uranium from Colonies

THE UK Atomic Energy Authority are prepared to buy annually from existing or future mines in Kenya, Uganda, Tanganyika, Swaziland and British Guiana, chemical concentrates containing up to 500 short tons of uranium oxide (U_3O_8). Contracts will cover a 10-year period.

The authority states it will 'offer prices that are reasonable in the light of world conditions at the time, having regard to the principles on which prices for uranium have been negotiated elsewhere'.

Radioisotopes Rival Nuclear Energy for Benefits to Humanity

THE LARGE radioactive sources now becoming available, particularly from fission products from power reactors, were opening up exciting new fields of application and there was no knowing at present how great might be their impact on scientific methods and materials. This was stated by Sir John Cockcroft, director of the UK Atomic Energy Research Establishment, when he opened the UNESCO international conference on radioisotopes in scientific research in Paris on Monday.

Attended by 960 scientists, including 143 from the UK and 71 from the USSR, the conference continues until 20 September. The papers to be read deal with developments since the last conference held in Geneva in 1955 and will include 33 papers from British scientists, of which 12 originate from AERE at Harwell.

Referring to the growing use of radioisotopes, Sir John said that what had been established already had shown the importance of radioisotope techniques in such wide and diverse fields that they rivalled nuclear power itself for their benefits to humanity.

While industrial research and process control benefited greatly by the use of radioactive techniques, it was as a research tool in the laboratory that isotopes had shown their greatest strength. The last 10 years had seen a revolution in the biological sciences in our knowledge of metabolic processes, brought about very largely by the application of tracer techniques. In agriculture and animal husbandry, research had received a tremendous stimulus, which would inevitably have far reaching results in the farming of the future.

Particularly notable, declared Sir John, were the advances in biochemistry by the introduction of new compounds labelled with tritium and carbon 14. Newly developed techniques would be discussed which would broaden the front of their attack on chemical and biochemical problems. More established methods such as radio-chromatography and authoradiography had been refined and extended in their usefulness. Isotopes had proved a most significant tool in enlightening scientists on aspects of metabolism.

Sir John was also impressed with the great advances made through the application of radioisotope techniques to the study of photosynthesis and the biosynthesis of components of chlorophyll.

Since the last conference in 1955, nations had become increasingly conscious of the potentialities of isotope techniques. Many new laboratories had now been established for research of that kind, even by smaller nations, and the larger nations had made training facilities available to all.

The building of new reactors with high neutron fluxes and of other high energy machines capable of producing new spallation products would alone have justified the present conference. When they were supported as they were by new methods of detection, such as the plastic and liquid phosphors as used in scintillation counters, and new principles of use, the calling of regular meetings became imperative.

GROWTH OF THE UK AEROSOL INDUSTRY

Parallel Development of Propellants

BRITAIN'S aerosol industry can be said to have begun in 1950, but it is only in the last three years that sales figures indicate a steady progress. From the half million units sold in 1950 the figure has risen, with last year's figures reaching eight million units. This year sales are expected to exceed 12 million units.

Aerosols, of course, require special packings. According to A. Herzka (Metal Box Co. Ltd., writing in the latest issue of *Aerosol Age*, 1957, **2**, 12) three types of container are available, the tinplate dispenser, the aluminium dispenser, the p.v.c.-coated and glass dispenser. Blow plastics dispensers and other types of plastic dispensers are being developed, however.

Supplies of the various dispensers are as follows: the tinplate dispenser, Metal Box Co., (tinplate division) and aluminium dispensers, Metal Box (aluminium division) and London Aluminium (Containers) Ltd. About 80 per cent of the total units packed employ the tinplate dispenser, which is available in six- and 12-ounce capacities. Aluminium extrusions are available in four capacities ranging from 4 to 20 ounces. P.v.c.-coated glass aerosol bottles have only been available within the last two years and are supplied by one company. Valves required for aerosol containers are all of overseas origin, with the majority of US origin. The main US valve employed is the Precision valve, made in Britain under license, other US valves used are the Risdon, the VCA and K38 (aerosol research). Of French origin is the all-metal SAFCA valve, used chiefly for paints, etc., and from Italy small quantities of the Vapsol valve are being imported. Metering valves are not at present available, although a pharmaceutical company is believed to hold the manufacturing right for a US type. This type of valve is necessary for the pharmaceutical preparations.

Re-usable Valve

Only the Italian valve is of the re-usable type. This is used with a glass dispenser. The cost of this type of valve is expensive. Of the six contract fillers for aerosols in Great Britain, Metal Box Co., is generally considered the main one. Cold (low temperature) filling is the most widely used method although most of the contractors are equipped for pressure (injection) filling. Pressure filling equipment was, until recently, available from a German company and two Swiss concerns, and the equipment was expensive. A British manufacturer has now entered the field, however, with reasonably priced equipment. Pharmaceutical companies tend to carry out their own packing, mainly for reasons of sterility control.

With the growth of the aerosol industry, there has grown up a demand for propellants. Propellants are produced in Great Britain by Imperial Chemical Industries Ltd. (Arcton), and Imperial Smelting Corporation Ltd. (Isceon). The two other suppliers are E. I. Du Pont de Nemours and Co. Inc., US (Freon), and Montecatini SA, Italy (Algofrene).

Chemically the propellants are: trichloromono-fluoromethane—Algofrene 1, Arcton 9 and Isceon 131; dichlorodifluoromethane—Algofrene 2, Arcton 6, Freon 12 and Isceon 122; dichloromonofluoromethane, Arcton 7; monochlorodifluoromethane, Arcton 4; trichlorotrifluoroethane, Arcton 63 and Freon 113; and dichlorotetrafluoroethane, Arcton 33, Freon 114 and Isceon 224.

Because of the high price of chlorofluorohydrocarbons, search is being made for cheaper propellant mixtures. Under consideration are odourless butane, propane, pentane and methylene chloride. Two suppliers of odourless butane are available in this country. For the handling and filling of butane, special installations are required by H.M. Inspector of Factories, and have been set up by two British contractors.

Herzka points out that aerosol research in Britain, is carried out mainly by the Metal Box Co. and some of the other contract fillers. In the US, it is the propellant manufacturer who is most concerned with fundamental research on aerosol formulations, etc.

The main types of product to be dispensed in an aerosol pack last year in Britain were insecticides for domestic and veterinary use. As sales of insecticides are affected by climate, products with all-the-year-round appeals such as air freshness are being increased.

Insecticide packs are made up of flying insect killers, moth proofers, residual insecticidal sprays and woodworm killers. Special veterinary insecticidal packs containing DDT, methoxychlor and butane are also available. Chlordane, dieldrin and DDT are the chief insecticides used in residual sprays at present, but more variations are considered likely when there is increased availability of the new insecticides such as Allethrin, Lethane, Perthane, MGK synergist 264 and MGK repellent 11.

Most popular of the cosmetic aerosol products in Britain are hair lacquers. Shellac or p.v.c.-based and p.v.p. formulations are used with such additives as castor oil, propylene glycols, lanolin derivatives and silicone fluids. The most usual solvent employed is ethyl alcohol with dichlorodifluoromethane and trichloromonofluoromethane mixtures as propellants.

Pharmaceutical preparations such as a plastic wound dressing, a hydrocortisone spray, an antibiotic spray and surface anaesthetics have been marketed for some time. Other products available in aerosol form are transparent chrome protectors, based chiefly on acrylic resins, lubricating oils, rust removers and shaving creams, though these latter have been slow starters in this country compared with US sales.

Industrially, flaw detection inks, belt lubricants, mould-release agents and touch-up lacquers are available. Increase in aerosol packaging is considered most likely in pharmaceuticals, fire extinguishers, glass cleaners, etc. Food products in pressurised dispensers are understood to be under development.

Ultrasonic Level Sensor Developed

A LIQUID level point sensor for process control and use in aircraft has been developed by Acoustica Associates, Glenwood Landing, New York, US. Known as Model RC-1A, it operates on ultrasonic principles to detect the presence or absence of liquid at a predetermined level.

Claims made for the sensor include: no moving parts; high sensitivity, virtually instantaneous response; simplified construction; minimum maintenance; reliability; no spark or radiation hazard; infinitesimal power drain; and operation over the temperature range —200°C to 125°C.

The basic sensor consists of a miniature hermetically sealed ultrasonic probe, measuring approximately 2 in. in length by ⅜ in. external diameter. The probe is mounted vertically in a tank and an electronic control unit is placed at any convenient position outside the tank. The probe weighs 1 oz. and the control unit 6 oz.

Further claims for the new sensor are: a response time of less than 10 milliseconds; a total power drain from a 24–29-volt d.c. source of 15 milliwatts with the control relay de-energised and only 130 milliwatts with the integral signalling relay energised; as well as the ability to sense level repeatedly to an accuracy of better than $^1/_{64}$ in. The probe will ignore foam or clinging droplets.

Various modifications to the probe are available to meet particular mounting and connecting problems and to 'average out' waves in moving tanks. The sensor can also be used to detect the presence or absence of fuel flow in pipes down to 1 in. diameter.

The control unit uses a single silicon transistor arranged so that no power is applied to the probe when it is immersed in liquid. When the probe is out of the liquid, there is insufficient power at the probe or in the connecting cable to ignite flammable fumes.

Groups of these sensors may be used as high-low level alarms, indicators of discrete fuel levels and for proportioning the flow of several liquids to a common mixing point.

Wobbe Index

In 'Equipment Review' of 10 August, p. 217, Wobbe index was wrongly described. Wobbe index is the rate of thermal delivery of a gas and can be expressed as the calorific value divided by the square root of the specific gravity, and not as stated.

THE international conference that opened in Paris this week on the uses of radioisotopes as a research tool represents the biggest exchange of information on atomic subjects since the earlier conference in Geneva in 1955. Alembic was interested to learn that all the papers to be read between now and 20 September will deal entirely with developments since 1955.

They will include 35 UK papers of which 12 will be given by members of AERE staff at Harwell. The other UK papers are from scientists in industrial organisations, universities, hospitals and agricultural research centres and range from research into work with radioactive isotopes on sea organisms and mushrooms to studies of their effects on the human body.

Conference president, Sir John Cockcroft, AERE director, made special reference to the wide interest taken in the meeting in his opening address. He declared that it was seldom that a single tool or technique was the uniting factor in bringing together scientists in such different fields. Radioisotopes have achieved that because of their unique properties as research tools and because they are applicable to every branch of experimental science.

Alembic hopes that as a result of this important conference, UK research workers will make even greater use of radioisotopes in their work.

THE British Association has been under fire in recent years largely because a lack of funds has hampered its development along more useful lines at a time when more specialised societies were growing up and stealing much of the association's thunder. There is no doubt in Alembic's mind that there will always be a need for the BA, particularly as a means of interesting the public in the work of the scientist.

Now that a group of industrialists have presented £40,000 to the association, the way is surely clear for the reforms planned by the council. The council aims to fill in the association's year between the annual meetings that have assumed such enormous proportions. It is generally agreed that papers containing detailed research procedure should not be presented at annual meetings and that the number of speakers, usually around the 300 mark, should be curtailed.

In between annual meetings, it is planned to devote more effort to organising study groups concerned with the relations of science and society. It is also proposed to organise short conferences on subjects of immediate importance. Of great interest to Alembic is the plan to examine the suitability of school curricula in modern conditions. A special group is planned to consider whether every schoolchild is given an education that includes a basic minimum of science.

Much more can be expected from the association by way of contacts with the Press, by publications and by co-operation with the television authorities; all with the aim of disseminating scientific knowledge.

These are immensely worthwhile projects, and Alembic hopes they will be carried out. The co-operation of other learned societies will doubtless be sought, for many have yet to learn the value both to their members and to the industries and groups they cover, of a policy of publicising their activities.

THE successful netting of a valuable Italian order for butadiene was the beginning of many months' difficulties for the ICI Billingham division olefine works at Wilton. The main snag was one of transportation. Road and ship had to be ruled out because of inadequate facilities.

Rail tanker was the method decided on and a number of suitable tankers were hired and some ICI liquefied ammonia wagons were modified. First they had to be treated with a solution of sodium nitrate to make them safe for carrying butadiene. They then had to be filled from Wilton Works which has no railway track. Pipeline would have been too costly to instal so each wagon was shunted on to a trailer fitted with rails and taken to Wilton for filling.

As part of the conversion, each of the existing wagons had to be fitted with a sunshield to keep the loads cool. Buffers had to be modified and continental screw-type couplings fitted. Each tank wagon had to be fitted with air brake couplings which were specially imported. Signs in German, Italian, French and English were painted on. In addition, each shipment involved the preparation of more than 100 documents.

Even so, deliveries began a month ahead of schedule!

FOLLOWING a report from our South African correspondent in 'Overseas News' last week about the probable use in the Union of two new American herbicides, Alembic learns from the technical information department of Fisons Pest Control Ltd. that Professor R. L. Wain, at Wye College, Kent, carried out 'stimulating studies leading to the value of these growth-regulating substances for weeds in leguminous crops'.

The two herbicides were 4-(2, 4-DB) (4-(2-4-dichlorophenoxy)-butyric acid and 4-(MCPB) (4-(2-methyl-4-chlorophenoxy)-butyric acid) and according to our correspondent have also been studied at the Agriculture Research Centre, Beltsville, Maryland, US.

These selective herbicides are being made in this country. Alembic hears from May and Baker Ltd., Dagenham, that 2, 4-DB, being produced by them, has just been introduced to New Zealand, where it is being distributed by their NZ company. It has been undergoing trials in South Africa and is due to be introduced to the UK trade in a few weeks time under the brand name of Embutox.

May and Baker have been making 4-MCPB since 1954; it is sold in this country under the name of Tropotox.

ALEMBIC, suitably clothed in the traditional sackcloth, hastens to correct a slip that occurred in 'Distillates' of 24 August. Then, commenting on the *Financial Times* chemicals supplement, he said that phthalic anhydride was among the materials being made in the UK by Petrochemicals at Partington.

This reference should, of course, have been to naphthalene, which is a raw material for phthalic anhydride.

MR. H. B. CADOGAN, chief superintendent of the marine division of Semtex Ltd., is on his way to Japan with Mr. P. H. Robin, chief technical officer, in order to establish in Dunlop's Kobe factory the manufacture of fleximer deck coverings. These will be based on natural and synthetic latex and on Neoprene latex for exposed deck treatments.

At present magnesite is used extensively in Japanese shipbuilding yards, but it is interesting to record that magnesite has gone out of popularity in this country and is not favoured by the Ministry of Transport. The reason is that because of the chemical make up of this material, it has a very severe corrosive effect on the steel, an effect which can become evident shortly after the delivery of a new ship.

RESULTS of research work obtained nearly a quarter of a century ago have been published by the Textile Institute to save US workers in the same field much time and labour in rediscovering already known facts.

Between 1931 and 1943, a number of papers dealing mainly with the effect of singles twist, doubling twist and doubling tension on certain physical properties of folded yarns were circulated privately to members by the British Cotton Industry Research Association (Shirley Institute). Authors of the papers are Mr. A. F. W. Coulson, a director of R. Greg and Co., and Mr. G. Dakin of the research association.

Information was received recently that US workers were following much the same lines as this earlier work. Alembic applauds this example of how helpful research workers can be to one another by the disclosure of previously private papers.

Alembic

'Cost of Water Purification Halved by New Process'

TOBRUK, Libya, is to receive an experimental plant for the de-salting of brackish water from Britain early in the new year. A demonstration was held last week at the Rickmansworth factory of William Boby Ltd., who developed the plant in association with TNO Holland, and the Chemical Research Laboratory of the Department of Scientific and Industrial Research.

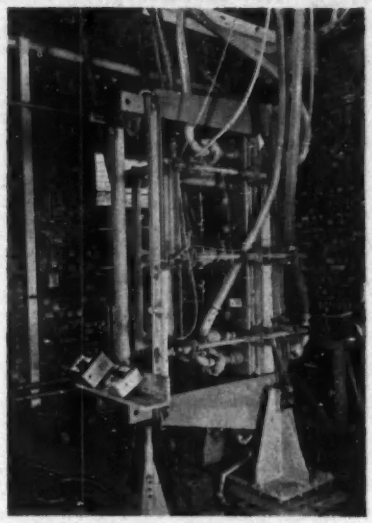
The principle employed is a new one to this country, known as the electrodialytic membrane de-salting process. Mention of this, and other methods of purifying water was made in CHEMICAL AGE, 25 May 1957, p. 888 and 15 June, p. 1005. Although the plant can de-salt any concentrations of dissolved solids, it is uneconomical above 10,000 p.p.m., and in Tobruk it will treat water of about 5,000 p.p.m. of salt. This is considerably less than is found in sea water, but representative of a large part of the world's natural supplies of water.

Brackish water to be treated flows through a cell formed from two ion-permeable polystyrene membranes. One of the membranes is permeable to positive, and the other to negative ions. A small electric current is passed through the cells between two electrodes situated outside it and rinse water flows in the electrode compartments. In the plant to be installed at Tobruk this rinse water will be sea water. The ions forming the salinity in the brackish water are attracted towards the electrodes according to their electrical charge, and pass through the membranes and into the rinse water flowing through the electrode compartments, and are discarded.

Electricity Consumption

Electricity needed to de-salt 5,000 p.p.m. is about 7 kW hours for 1,000 gall. of water, and the plant can produce 40 tons of potable water a day, using 200 membranes. If 400 membranes were used, 80 tons could be produced. William Boby say that the running cost of their de-salting plant is about 5s. per 1,000 gall., compared with 11-12s. for an orthodox evaporator, and that the water produced is more palatable than that by distillation, because all the dissolved gases have not been removed. Extensive use of plastics piping and valves is employed in the plant to reduce corrosion risks, and pH control is provided to prevent deterioration by calcium and magnesium precipitation. 1 ml. of hydrochloric acid is needed to treat 8 gall. of water, the acid forming entirely soluble salts with calcium, magnesium and sodium. The plant can be operated and maintained by native staff, it is claimed. The makers quote a cost of £8,000-£10,000 and a delivery time of 9 months for a 1,000 g.p.h. plant and £70,000-£80,000 and a delivery time of a year for a 10,000 g.p.h. plant.

William Boby say that the plant will operate on an experimental basis in Tobruk for the next two years and they forecast a great future for this process, wherever a community needs usable water at an economical cost. Israel, Tanganyika and Malta are reported to be interested, as well as companies in this country who need water for industrial use.



Boby's de-salting plant

Olympia Booking Doubled for Chemical Engineering Show Next June

DEMAND for space at the Chemical and Petroleum Engineering Exhibition, to be held at Olympia from 18 to 28 June 1958, has been so great that the original accommodation has been doubled and already more than 200 manufacturers have booked stands. Exhibitors will include firms who contract for complete chemical works, as well as suppliers of process plants for the production of heavy chemicals, fertilisers, explosives, coal-tar products, petrochemicals, fine chemicals and pharmaceuticals, paints and varnishes, plastics and many other chemicals and chemical products.

A wide range of plant will also be shown in the traditional, as well as the more recently developed ferrous and non-ferrous metals and alloys, in stoneware, fused silica, plastics, carbon and glass.

Sponsored by the British Chemical Plant Manufacturers' Association and the Council of British Manufacturers of Petroleum Equipment, the organisers are F. W. Bridges and Sons Ltd., Grand Buildings, Trafalgar Square, London WC2.

Instrument Display

A comprehensive range of general industrial instrumentation is to be shown by Kelvin and Hughes Ltd. at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham 2, on 30 September and 1 October. Those interested in attending should contact Mr. R. A. Senior at the centre.

New HQ for Instrumentation Company

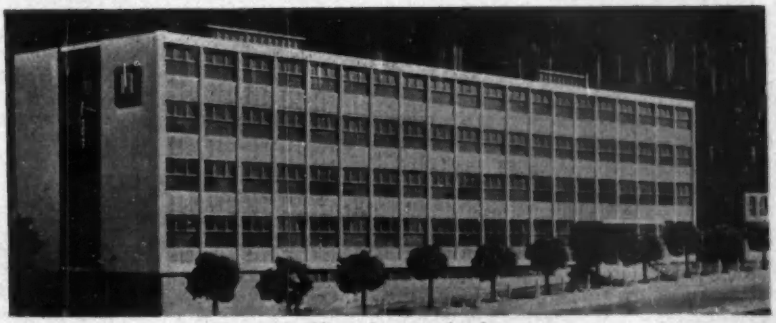
AN imposing modern building of 483,000 cu. ft. will accommodate, in Greenford, Middx., the administration of all divisions—industrial instrumentation, thermostatic controls, and micro switches—when the new head offices of Honeywell-Brown Ltd. are opened in June 1958. The foundation stone was laid recently by Mr. E. C. Vorlander, managing director.

A new training school will be housed in one part of the building. In a fully equipped lecture theatre and laboratory, employees and users from all over Europe will be taught how to apply modern instrumentation to industrial processes and heating and air conditioning systems. The school will also provide courses on micro switching.

Multi-purpose telephone receivers will combine outside call and internal facilities in one instrument. An outside caller will be able to hold a conference with up to four inside speakers, speaking from their own desks. This dual purpose facility, said to be the first of its kind in this country, has been made possible by special arrangement with the GPO.

New Ovens for Workington

A battery of 53 coke ovens has been commissioned by the Workington Iron and Steel Co. at the cost of £850,000. With this new battery Workington now have a total of 75 ovens, and they intend to increase the production of gas, tar, refined benzole and sulphate of ammonia.



The new building when completed next year

Discovery of Element 102 'Nobelium' Outlined

BA Annual Meeting in Dublin

THERE are now possibilities of producing about half a dozen new chemical elements starting either with a higher isotope of curium or californium 252. This was stated by Dr. H. A. McKay, head of the heavy elements group of the chemical division at Harwell and Dr. Y. Hulstead, also a member of the same division, in their paper during a special session on the recent discovery of element 102, which it has now been decided to call nobelium.

In the making of nobelium the basis had been curium 244 made in the materials testing reactor at the Argonne National Laboratory, Idaho US. Harwell had provided separated carbon 13 with which the curium was bombarded, while the Nobel Institute of Physics, Stockholm, provided the high energy acceleration in which the carbon 13 particles were accelerated.

It was disclosed for the first time in this report that in the recently completed experiments at Stockholm, the radioactive disintegration of 17 atoms of the new element was observed. From this fact Dr. Mulstead estimated that the experiment might have produced something like 50 atoms of nobelium. Thirty-three of these would have disappeared by radioactive disintegration before the material could have been transferred from the cyclotron.

Cost of each of the new atoms was about £1,000 to make. From this it was estimated that half a gram of the new material would cost £1 million million million million, more than the national income of the world since human life began.

Dr. McKay suggested that the isotope of nobelium produced at Stockholm might prove to be more unstable than would heavier isotopes when these were produced. He thought, however, that none of these isotopes would be able to exist for periods of more than a day or so—and it was very likely that the most stable element would lose half of its substance every hour. Elements still farther up the periodic table would necessarily not last as long.

The question of the name given to the element was discussed. Dr. Hulstead reported that the discoverer of the element favoured the spelling—nobelium, with one 'l' since this would suggest the spelling of Nobel, the title of the Institute. They hoped, however, that it would be pronounced as if spelt with two 'l's.

Polythene and 'Tailor-Made' Plastics Discussed by Professor Mark

'TAILOR-MADE' plastics were considered by Professor H. F. Mark, director of the Institute of Polymer Research at Brooklyn, New York, in his paper on '*Stereospecific polymerisations.*' Experimental results showing that materials with melting points as high as 600°F —well above the range required for hot water pipes—were quoted by the professor, in indicating a disadvantage of polythene, which was a comparatively soft material softening at a low temperature. The reason for the comparatively low melting point was that the individual molecules of the 'high pressure' polythene were not simple long chains of carbon atoms. Instead, they had side chains of carbon atoms.

In endeavouring to find more satisfactory material, Professor Mark said it was essential to find a means of producing molecules of polythene which had fewer side chains. He referred to German research work which had shown that it was possible to polymerise ethylene by allowing it to undergo chemical reaction in the presence of the Ziegler catalysts.

Professor Mark suggested that there was now such a large variety of different manufacturing methods which could lead to hard and high-melting polythene that none of the processes which have been patented, could be expected to remain the prerogative of individual companies. He remarked that it was rare in the history of the chemical industry to find what had seemed a few years ago to be an impregnable position on the part of the first companies who had patented the original manufacturing rights and for those who had acquired rights to the German process, now being broken open so quickly.

Making and breaking polymer molecules was the subject chosen by Dr. L. Bateman, director of research, British Rubber Producers' Association. In his paper (entitled '*The mechanico-chemistry of polymers*') he demonstrated a new method of making mixed polymers. He described it as 'spectacular and far-reaching'. It could be applied, he said, to any polymer including rubber, of which the molecules could be broken down by chemical shearing. In effect, reactive groups were produced which could be used to polymerise a different material. The result was that mixed polymers of very varied properties could be produced.

Conditions required for such reactions were simple and machines suitable for continuous operation had been used successfully.

Will

MR. ALBERT JOHN MORGAN, of 159 High Street, Rayleigh, Essex, a former works manager of Lysol, Ltd., manufacturing chemists, who died on 15 April last, intestate, left £5,046 gross.

ICI Co-operate in Argentine PVC Project

A FACTORY to manufacture p.v.c. will shortly be built by Electroclor SAIC at Capitan Bermudez, Rosario, Argentina. Initial capacity will be 4,000 tons a year, but the lay-out will permit of the capacity being increased to keep pace with growing Argentine demands.

Although the capital required for this enterprise—approximately 150 million Argentine pesos (approximately £3 million) —will be supplied principally by Electroclor's two main shareholders, i.e. Industrias Quimicas Argentinas Duperial SAIC (a subsidiary of ICI) and Celulosa Argentina SAIC, it is intended that Argentine investors should, in the near future, be given an opportunity to purchase shares in Electroclor, a company that is developing rapidly.

The plant has been designed by Imperial Chemical Industries Ltd. who will also train technical staff for its operation.

Ashdowns Plant to Close at Year-End

ASHDOWNS LTD., group manufacturers of fibre-glass laminates and plastics components, are to be closed down by 31 December after outstanding trade commitments have been met, state Pilkington Brothers Ltd., St. Helens. The company employs 700 workers at its new factory at St. Helens, which was described in CHEMICAL AGE, 1 June, p. 933.

Pilkington Brothers consider that long-term prospects 'are not sufficient to justify the further substantial investment which would be necessary and have decided it would be to the greater benefit of the group to employ those resources in the main business of glass-making.'

The activities of Mendip (Chemical Engineering) Ltd., the acquisition of which was announced at the time of the opening of the new factory, will continue. The decision to close Ashdowns does not imply that the group believe that fibre-glass has no future, on the contrary it is believed to be a material with a great promise.

Liquid Oxygen Plant

British Oxygen Gases Ltd. are to develop a site in Polmadie Road, Glasgow, for the production of liquid oxygen. The South of Scotland Electricity Board have prepared a scheme for the supply of electricity, which on the initial capacity amounts to 5,400 kW., and further developments may result in a total demand of about 20,000 kW.

Mothproofing Carpets

Permanent mothproofing of carpets, rugs and upholstery fabrics can, it is said, now be achieved with the introduction of a new mothproofing agent, Dielmoth, a product that has been introduced by Shell Chemical Co. Extensive tests have shown that it has no toxic effect when applied to these fabrics in accordance with the recommended method: nor is affected by ordinary washing or dry cleaning. Manufacturers are recommended to use 0.1 per cent of Dielmoth on wool in an acid dyebath at a temperature of 200 to 212°F.

Simplified 'Enforced Order' Mixer, Extruder, Stirrer

by Dr. M. S. Frenkel

A SIMPLIFIED development of the 'enforced order' mixer, extruder, crusher, etc., construction introduced in the author's article in CHEMICAL AGE **1** and in other journals **2, 3, 4, 5, 6, 7, 8, 9, 10** is described below. Original constructions have since been confirmed experimentally, as a continuous mixer for viscous materials or fatty substances; for obtaining complete uniformity in mixing of different coloured clays; for dispersing particles in plastic substances (e.g., a microscopically uniform dispersal of 2 per cent carbon black in a plastic in one run-through); for dispersing liquid into gases (petrol economiser); as a crusher for coal, lime-stone, etc.; as a dynamic seal.

The present construction is one of a series of simplified constructions derived from the author's principle of 'convergence-divergence'. **4, 5, 11** It covers a wide range of applications such as continuous mixer, extruder, mincer (Fig. 1), as batch mixer (Fig. 2), stirrer, emulsifyer (Fig. 3), stirrer and heat transfer device (Fig. 4).

In the original 'enforced order' mixers, the inner and the outer screw components rotate in opposite directions, there is a conical interface between the components permitting relative axial displacement for adjustment of clearance, and the opposite-handed helical threads in the components have complementary variation of groove cross-section between maximum and zero area, with the maximum cross-section of one groove facing zero section of the other (1–9). Besides complete material-transfer, both components, owing to their rotation, provide forward drives.

The present simplification is for constructions where only one of the components is rotated, combining a saving in driving mechanisms and manufacturing effort with advantageous performance.

Where there is only one rotatable component, helical (or otherwise curved) grooves in the non-rotating component do not exert a forward drive as they would do in a rotating component, but only exert resistance against forward transport of the medium, which limits throughput and, for instance, the extrusion pressures at outlet.

To reduce this resistance to a minimum, the grooves in the non-rotating component should be formed as paths of minimum resistance—for example, extending along the straight generating lines of the conical interface (Figs. 1–4). The apex angle of the conical interface may, dependent on the application, have any value between 0° and 180°. In the latter extreme case the grooves become radial (Fig. 4).

Accordingly, the rotatable component with its helical (or spiral) thread produces the forward driving force which the medium is subjected to in both components. Reduction of the resistance in the non-rotating component by straightening the grooves removes any difficulties with throughput for a wide range of materials.

The driving force of the lands of the rotating screw is also increased by the lands of the non-rotating grooves being directed along the conical interface.

This simplified construction produces thorough mixing with required throughput by:

(i) Markedly reducing the resistance against forward transport in the non-rotating component, e.g. by providing straight grooves along the conical interface;

(ii) Producing a driving force from the rotating component which, owing to the complete material transfer, affects all particles of the medium in both the components;

(iii) Increasing the driving force owing to the lands of the non-rotating component being directed straight along the conical interface.

Required extrusion pressures can be produced for the desired throughput, the quantities being adjusted by the speed of the rotating component. Apart from having advantages in operation, straight grooves in the non-rotating component simplify manufacture and cleaning.

In Fig. 1—a continuous mixer, applicable as extruder—material entering through the funnel (6) is brought forward in feed section (5) of the screw and in the working section (7). By the gradual reduction of the cross-sectional area of the inner screw groove (8) with complementary increase of cross-section of the straight groove (9) between maximum and zero value, all the material is transferred to the outer component.

Suitable Treatment Provided

As every particle of the throughput has to pass through the transit zone (interface 10) between the rotating and stationary component, suitable treatment according to the type or state of material is provided, i.e. crushing for lumps, mincing for fibres, mixing for doughs or viscous or other fluids, both by the occurrences in the transition zone and by the vortices and other phenomena produced in the grooves themselves.

On account of the continuously conical interface (10), axial displacement of the inner screw for adjustment of the clearance is possible. This adjusts the intensity of the mixing in the transit zone, apart from the adjustment of this, and of the throughput, by the speed of rotation. Also affected is the heat input by mechanical working, which is uniform because of the treatment of all particles. Where required, cooling and/or heating provision may be made in one or both components. The intensive and ordered intermixing provides outstanding heat transfer.

An additional section in which return material transfer from the outer to the inner component takes place may be provided, completing the cycle. Such cycles may be continued.

In the batch mixer (Fig. 2) the inner shaft rotates and the material is transported downwards in its helical groove. Unable to flow out through the closed bottom (22), the material is forced up in the straight

KEY TO DRAWINGS

(1) Rotatable inner screw component (2) Non-rotating casing (3) Helical thread rotatable component (4) Straight vanes in casing (5) Feed section of inner screw (6) Entry funnel (7) Material transfer section of mixer (8) Grooves in helical screw, reducing from maximum to zero cross-sectional area (9) Straight grooves in casing, increasing from zero to maximum cross-sectional area (10) Conical interface between facing grooves, with adjustable clearance (11) End plate which may carry extrusion head, etc. (12) Outlet openings in end plate (13) Drive shaft (14) End bearing (15) Frame for suspension in vessel, and mounting of inner screw (20) Section with mutual and simultaneous material transfer between grooves 8 and 9 of inner and outer component (21) Entry chute (22) Bottom plate (23) Outlets (valve provision not shown) (24) Alternative central outlet (25) Drive shaft with internal heat exchanger provision (26) Annular heat exchanger passage in casing (27 and 28) Entry and exit ports to heat exchanger passage (29 and 30) Helical vanes in heat exchanger passage, opposite hand (31 and 32) Grooves formed between helical vanes, the grooves varying in complementary fashion between maximum and zero cross-sectional area, in a complete cycle starting with maximum cross-section of groove, going to zero, and on to another maximum cross-section (41) Rotor (42) Stationary vessel (43) Spiral thread in rotor (44) Straight (radial) vanes on bottom of vessel (45) Plane interface between components (46) Spiral grooves in rotor, reducing from maximum to zero (47) Straight grooves in vessel, increasing from zero to maximum cross-section, providing material transfer from rotor into stationary grooves (48) Drive shaft (49) Entry into rotor.

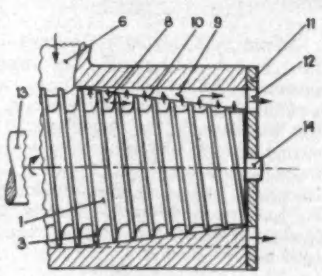


Fig 1

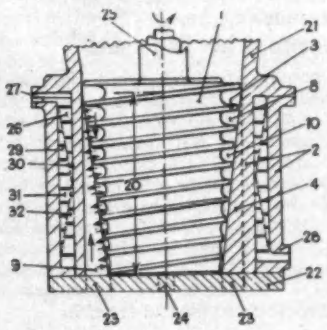


Fig 2

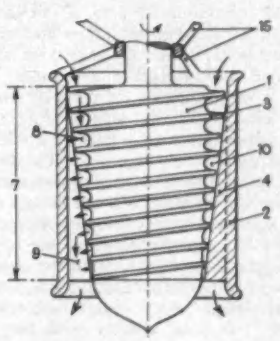
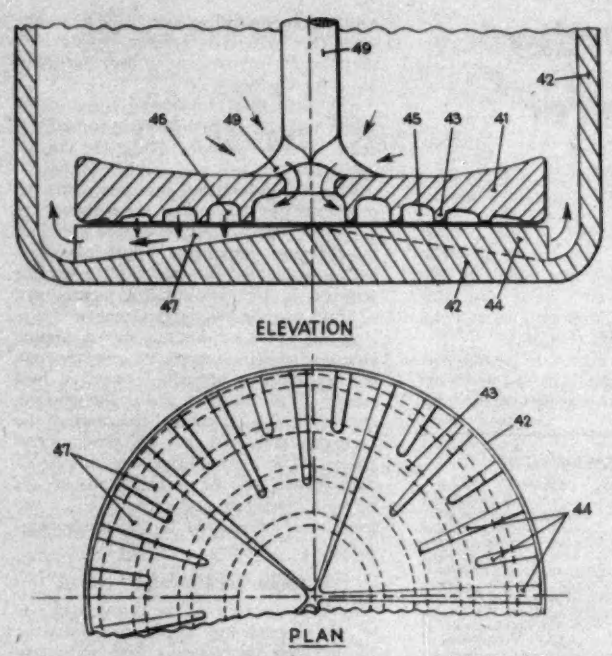


Fig 3

Fig. 4



grooves (9), under the pressure difference generated, thereby setting up a circulation. As the material in both components flows in the direction of decreasing groove cross-section, simultaneous two-way material transfer occurs between the inner and outer components throughout—providing more thorough intermixing in the transit zone of all particles of the charge than for the one-way transfer indicated in Fig. 1. By virtue of the zero depth of the grooves, no particle escapes being mixed in each circulation. When mixed the material is emptied under the pumping action of the rotor through openings (23) provided with valves which are not shown. Adjustment of clearance provides easy regulation of intensity of mixing, apart from the variation of speed.

The bottom of the internal screw may be formed as a spiral and the internal surface of cover (22) with radial vanes, or with opposite spiral grooves, with complementary variation of groove cross-sections as in Fig. 4. This utilises further surface for intermixing, and permits discharge through a central opening (24) with a suitable valve (not shown).

This example further illustrates the case of both components being non-rotating on the guide vanes (29 and 30) in the annular heat exchange passage (26). These guide vanes form opposite handed helices, which vary in cross-sectional area of the grooves (31 and 32) between maximum and zero in complementary fashion, according to the principle of 'convergence-divergence'. They form a complete cycle for material transfer from groove (32) on to groove (31) and back again, although a part or a multiple of such a cycle may be used. With the heat exchange medium being pumped through the annular passage (26), the helical vanes each set up a vortex motion in grooves (31 and 32) respectively, which vortices are transferred layer by layer into the opposite groove, the thinness of such layers depending on design. Each layer therefore has orderly individual contact with the heat transferring wall. This produces optimum heat transfer, thus eliminating all the detrimental effects of indiscriminate turbulence when useless intermixing occurs between large quantities of hot and hot particles, and between cold and cold particles.

Fig. 4 is a stirrer, for operation of which reference should be made to Fig. 1. This not only provides thorough intermixing of all particles but vigorous cycling of the medium in the pan, still or other vessel.

A stirrer can be designed having a flat interface (Fig. 4) (apex angle 180°) where rotating components operate against the non-rotating vanes formed in the bottom of the pan. Intermixing and circulation can be performed, and also precisely controllable heat transfer is possible through the bottom of the vessel, even for heat sensitive fluids.

REFERENCES

(1) Frenkel, M. S., CHEMICAL AGE, 1955, 72, 1435.
(2) *Id., Engineering*, 1956, 13 July.
(3) *Id., British Plastics*, 1956, Feb., p. 62 and March, p. 98.
(4) *Id., Ibid.*, 1956, May, p. 184.
(5) *Id., The Engineer's Digest*, 1956, Nov., p. 481.
(6) *Id., VDI Zeitschrift*, 1957, 99, 2 (11 Jan.).
(7) *Id., Materie Plastiche, Milan*, 1957, Jan., March and May.
(8) *Id., Mine and Quarry Engineering*, 1957, August, p. 334.
(9) *Id., Water Power*, 1956, March, p. 115.
(10) *Id., The Engineer's Digest*, 1956, Dec.
(11) *Id., Proc. I. Mech. E.*, 1953, 167, 736.

Decrease in Lead Consumption Reported

STATISTICS from the British Bureau of Non-ferrous Metal Statistics, 132 Hagley Road, Birmingham, show that consumption of lead in the first six months of 1957 amounted to 177,156 tons compared with 183,680 tons for the same period of 1956.

Of this total, battery oxides accounted for 11,968 tons (14,036), tetraethyl lead 10,577 tons (10,505), other oxides and compounds 11,537 tons (12,988) and white lead 4,768 tons (5,518). Metal used in batteries was 14,190 tons (14,825).

Chemical Engineering Expansion Planned at Loughborough

PLANS are under way at Loughborough College of Technology to provide a considerable expansion in chemical engineering facilities. The present floor space, which is in buildings located on a temporary site, is being doubled to provide over 8,000 sq. ft. of lecture room and laboratory space, which will be in use next session. Further increases in space are envisaged when the department moves to new buildings in about three years' time.

The greater part of this expansion is to provide for the greatly increased numbers of students on the full-time course. In addition, facilities are being provided for a new sandwich course, which is to commence early next year. This will be a dual or two-tier sandwich course, with an intake of two groups each year, one group being at the college while the other is in industry, thus minimising any dislocation of the personnel arrangements of any company sending students.

To increase the practical content in the full-time course, it is proposed to send students into industry for one year's full-time training at the end of their second year at the college. This would ease the load on industry by obviating the need for summer vacation training and at the same time provide firms with a man at a fairly advanced stage of training who is able to spend a whole year with the company and should be of considerable value during this time.

In charge of the department is Dr. D. C. Freshwater, formerly of Birmingham University. Dr. Freshwater has written articles and reviewed many books for CHEMICAL AGE.

Anyone interested in obtaining details of this scheme, or of the sandwich course, should write to the Head of the Department of Chemical Engineering, College of Technology, Loughborough, Leics.

Evening Courses to be Held at Cass College

EVENING courses to be held at the Sir John Cass College, Jewry Street, Aldgate, London EC3, in the 1957/58 session, include eight lectures on 'Radiochemistry and radioactivity' by A. G. Maddock, 'Spectrochemical analysis' by A. S. Nickelson, 'Absorption spectroscopy' by A. R. Philpotts and 'The fundamentals of brewing' by Professor R. H. Hopkins.

Application for enrolment in these courses should be made to the college secretary.

Advanced Chemistry Courses

The Brunel College of Technology, Department of Chemistry will open later this month at the Woodlands extension of Acton Technical College, Middlesex. The academic year 1957–58 will include courses in chemistry and technology of oils and fats, a laboratory course in chromatography, radiochemistry, the advanced chemistry and technology of waxes, high polymer chemistry and nuclear chemistry.

Oxidation of Oils in Presence of Surface Active Agents

British Pharmaceutical Conference

A STUDY of the oxidation of oils in the presence of surface-active substances has been undertaken by J. E. Carless and J. R. Nixon of the Pharmaceutics Laboratories, Chelsea School of Pharmacy, London. In their paper presented at the Pharmaceutical Society conference last week and entitled *The oxidation of solubilised and emulsified oils: Part 1, oxidation of benzaldehyde in potassium laurate and cetomacrogol dispersions,* Carless and Nixon reported that benzaldehyde, methyl linoleate and methyl oleate were chosen as simple reference compounds because of the complex oxidation reactions of natural products. These compounds oxidised by a chain reaction involving the intermediate formation of a peroxide. The effects of water soluble and oil soluble catalysts were also observed on the oxidation as it was thought that these could be expected to yield different results in systems possessing an oil-water interface. Copper sulphate and copper laurate were chosen as catalysts.

Solubility of benzaldehyde in solutions of potassium laurate and cetomacrogol was measured at 20°C. Oxidation rates of emulsified and solubilised benzaldehyde were observed manometrically at 25°C. In passing from a suspension, through an emulsion, to a solution, the rate of oxidation of benzaldehyde was reduced, with both the anionic and non-ionic surface active agents. This rate of oxidation was found to be directly proportional to catalyst concentration within the range 1×10^{-6} to 1×10^{-4} molar and that the catalyst coefficient was greater in the emulsions than in the solubilised preparations.

Complicated Studies

Oxidation studies of benzaldehyde in aqueous dispersions was complicated, the authors stated, by the possible different sites of reaction, namely: (a) In the benzaldehyde phase, in emulsion droplets or micelles. (b) At the benzaldehyde : water interface. (c) In the water phase (excluding micelles).

The rate of oxidation of solubilised benzaldehyde was found to be only slightly higher than for the uncatalysed reaction. In the emulsified system, catalysts had a marked effect. Copper sulphate proved to be a better catalyst than the oil soluble copper laurate and it was suggested that initiation reaction took place at the benzaldehyde:water interface more readily than in the globule itself. In potassium laurate systems any copper sulphate introduced underwent double decomposition to copper laurate, and thereby reduced the effectiveness of the catalyst.

On increasing the interface, by incorporating the benzaldehyde in micelles, the rate decreased until in the solubilised state it appeared to be independent of concentration of surface active agent.

Dr. Frank Hartley, BDH scientific services director, who, as reported in Chemical Age last week (p. 359) was chairman of the conference

Evidence obtained indicated that most oxidation occurred within the emulsion globules of benzaldehyde. Additions of cetomacrogol to already oxidising suspensions of benzaldehyde produced emulsions and 'solutions' which oxidised at about the same rate. Once oxidation had been initiated in the micelle or emulsion droplet, it proceeded rapidly.

In the solubilised state oxidation was apparently confined to reaction in true solution in water. The oxidation rate of a saturated solution of benzaldehyde in water was 750 and 2,200 μl./g./hour at 25°C and 35°C respectively. This was only slightly above the oxidation rate for benzaldehyde solubilised by cetomacrogol or potassium laurate. It is suggested therefore that in the solubilised state oxidation took place almost exclusively in true solution in the water.

Oxidation of benzaldehyde was further complicated by reaction of the surface-active agent with intermediates in the oxidation process. Cetomacrogol was peroxidised and benzoic acid formed. Perbenzoic acid has been found to be the main oxidation product, the authors remark, when there was as much as 20 per cent decomposition of benzaldehyde. This was a probable reason for the low oxidation rate in solubilised systems.

Another possible complication according to Carless and Nixon was polymerisation of benzaldehyde, since it had been shown that solubilisation in soap micelles offered conditions favourable to polymerisation. This was being investigated for if polymerisation of benzaldehyde occurred, then the effective concentration available for oxidation would be lowered and the rate of oxidation reduced. There was evidence that decomposition of benzaldehyde proceeded other than by oxidation and it was probable that polymerisation was taking place.

Non-aqueous Titration of Phenolic Compounds

In presenting their paper on *The non-aqueous titration of phenolic compounds*, J. Allen and E. T. Geddes, analytical department, The British Drug Houses Ltd., Graham Street, London, stated that volumetric determination of very weak acids by titration in non-aqueous solvents had been investigated by a number of workers. The earliest successful method had been that of Moss *et al* (*Analyt. Chem.*, 1948, **20**, 784), using ethylenediamine as solvent and a solution of sodium aminoethoxide in ethylenediamine as titrant. A number of different solvents and titrants had been proposed since then and also the use of various electrode systems. The present paper gave details of a procedure for the potentiometric determination of very weak acids that was simple, convenient and sufficiently reliable for routine use.

Allen and Geddes reported that in a suitable solvent system, the glass electrode as indicating electrode was the most stable and reproducible of those examined. In particular, the saturated calomel electrode was the most convenient and reliable reference electrode. A conventional sleeve-type calomel electrode had been used throughout the present study, and for routine application it had been found useful to separate the ground sleeve from the main bulk of potassium chloride in the body of the electrode vessel with a plug of Gooch asbestos drawn into the capillary by suction.

For routine use the unpleasant nature of ethylenediamine made it desirable to find a satisfactory alternative. Dimethylformamide had proved suitable for the titration of all but the most weakly acidic phenols. It also appeared to be a better solvent than either ethylenediamine or *n*-butylamine for phenolates, since many of the phenols examined gave a precipitate during titration in ethylenediamine even with ammonium type base as titrant.

The pure grade of dimethylformamide should be neutralised to the blue colour of azo violet when it is suitable for immediate use if the titration is carried out on the deci-normal scale. Allen and Geddes stated that blank titration on an average sample should not exceed 0.8–1.0 ml. 0.1N base per 100 ml. When used for smaller-scale titrations, dimethylformamide should be shaken occasionally during 24 hours with barium oxide and redistilled. After such treatment this solvent can be stored in a well-filled glass-stoppered bottle for some weeks with traces of acidity developing.

Dimethylformamide was found to be a good solvent for the base, but decomposition occurred after about two hours. A solution of tetrabutylammonium hydroxide in benzene and methanol. (*Analyt. Chem.*, 1956, **28**, 792) had been used. This was stated to be stable if stored so that absorption of carbon dioxide was minimal.

It was prepared from the iodide (see reference above).

A 50- or 100-ml. tallform beaker closed by a cork shive and fitted with two electrodes and the tip of a 10-ml. micro burette, graduated to 0.05 ml., was used. Magnetic stirring was employed. With N/25 scale or weaker solutions, nitrogen was used to flush vessel and contents. Cell e.m.f. was measured by a Pye direct reading pH meter with a glass and calomel electrode system. The conventional glass electrode was immersed in dimethylformamide for 24 hours before use. These investigations recommend that a special electrode be kept exclusively for this work and stored in the solvent.

Results obtained indicated that a rather steep slope of that part of the curves preceding the end point was characteristic of this solvent-electrode system. Height of the step in the e.m.f. to volume of titrant curve was about 100 to 150 mV. for most phenolic compounds examined. Thus resorcinol gave a step of about 75 mV. Picric acid, a relatively strong acid, produced a step of nearly 1.5 V.

According to Allen and Geddes, the superiority of tetrabutylammonium hydroxide as a titrant for phenolic compounds in dimethylformamide with the glass and calomel electrode system was shown by the increased step height obtained compared with the more usual alkali methoxide solution.

The three synthetic phenolic oestrogens (stilboestrol, hexoestrol and dienoestrol) gave only one step, although dihydroxy compounds, thus corresponding to the titration of a single phenolic group. As the curve shapes were anomalous with oestradiol and ethinyloestradiol it is suggested that the differential curve should be plotted when titrating these substances.

Polyhydric phenols, resorcinol, hexylresorcinol, dithranol, propyl gallate and dichlorophene gave only one inflection point on the titration curve which was sufficiently well marked to be used as an indication of the end point. In each case the equivalent is equal to the molecular weight.

US TREASURY LIST CHEMICALS FOR IMPORT VALUATION

IT WAS ANNOUNCED in the *Board of Trade Journal* for 1 December 1956 that the US Treasury was preparing a preliminary list of commodities that would be liable to be valued on the basis of 'Foreign value' (i.e. value in the exporter's home market) when the Customs Simplification Act of 1957 came into force.

The list, which is printed below, was published on 23 August. No item can be deleted. Within 60 days of publication domestic manufacturers may apply to the US Treasury suggesting additions. The Treasury will publish a final list towards the end of the year. Thirty days thereafter all items not included in it will be appraised under the new provisions of the Act.

Chemicals, Oils and Paints

COAL TAR PRODUCTS

Colours, Dyes, Stains, Colour Acids, Bases and Similar Products; Intermediates.

ACETATE RAYON DYES

Artisil: direct blue GFL, direct orange RFL; Rigan sky blue G; Setacyl: blue for discharge G, brown 2GR, orange 2R, red GBN, violet BR, violet 2R.

ACID DYES

Acid: anthracene red 3BL, leather brown GBL, leather dark brown G, leather dark brown R, light scarlet GL, magenta FB extra, pure blue R supra I, red 3BL; Alizarines: fast brown G, light brown BL, light blue ESE, light blue FG, light blue HR, violet RCN, milling green B, pure blue BL, supra blue SES; Antraquinone: violet, violet D.

Brilliant alizarine: light blue 3F, milling blue FGL, milling blue FBL, milling red FBL, milling violet FBL, sky blue; Brilliant kiton red B; Brilliant sky blue 8G; Brilliant sulphur red SB.

Carbolan crimson BS; Cibalans: blue BL, bordeaux 3BL, bordeaux GRL, brilliant yellow 3GL, brown BL, brown TL, Cibalan brown 5RL, corinth BL, grey BL, grey 2GL, green GL, red 2GL, scarlet GL, scarlet GL, violet RL, yellow GRL; Cloth fasts: brilliant red, bordeaux B, brilliant violet, orange G, red 3B, red 2BL, yellow 2G.

Derma grey LL; Erio: fast brown 5GL, fast brown 5RL; Fast blue LM; Fast silk sky blue; Indocyanine B; Irgalans: blue GL, bordeaux 2BL, brown 3BL, brown 2GL, brown 2RL, brown 7RL, brown violet DL, dark brown 5R, grey BL, green BLS, olive BGL, orange RL, red BLS, red 3G, rubine RL, violet 5RL, yellow GL, yellow 5GLS.

Lanasyns: brown RL, brown 3RL, orange RCN; methyl lyons blue, salt free, Neolan yellow 8GE; Neutrals: orange GX, orange RX, yellow GX, yellow RX; Oxanal turquoise blue FGLL; paper fast bordeaux B; Polars: blue G supra I, brilliant blue GAW, brilliant red B, brilliant red 3B, brilliant red BN, brilliant red 10B, brilliant violet BL, brown 2GL, grey, maroon, red RL.

Sella acids: brown B supra I, brown G supra I, brown R supra I, fast black FF; Silk brown 3R; Sulfonines: brilliant red 3B, grey BWL, grey G, scarlet GWL; Supramine red B; Wool fast blue FBL; Xylenes: cyanol FF, fast orange P, fast red P, light yellow R, milling yellow R, red R.

BASIC DYES

Brilliant sky blue RRM; Diorlene blue 5G; Diorlene brilliant red 3B; Selopaline supra I.

COLOUR LAKES, AND OIL AND SPIRIT SOLUBLE DYES

Alcian blue 8GN; Grasols: blue R, fast black G, fast brilliant red BL; Helizanines: gold yellow G, grey B, olive green G, orange R, red B, red GR, red R, yellow G; Microsol brilliant blue G.

Orange G, dye for nitrocellulose lacquers, red dye for nitrocellulose lacquers, red B dye for nitrocellulose lacquers; Viscofils: blue BL, blue green BL, red RL, yellow 3GL.

DIRECT DYES

Brilliant direct pinks: B, 3B; Chloramines: brilliant green BN, fast brown R, fast brown 2R, fast brown 4RL, light grey B, light grey R; Chlorantines: fast blue 2BLL, fast brown 6GLL, fast brown 4RL, fast grey GLL, fast grey NGLL, fast olive GLL, fast orange 2RL, fast red 5GL, fast rubine RNLL, fast scarlet BNLL, light grey B; Copranthines: black RLL, blue GLL, blue RLL, bordeaux 2RLL, grey 2RLL, green G, green 3GLL, yellow 2G, yellow GRLL; Cuprofix: brown GRL, grey 3LB, navy blue CBL; Cuprophenyls: black RL, brilliant blue 2BL, brown GL, brown 2GL, brown 2RL, grey GRL, navy blue BL, navy blue RL, red BL, rubine RL, yellow RL, yellow brown RGL.

Derma: blue 2B, carbon B, carbon GTS; Diamine orange F; Diazamine fast bordeaux 2BWL, fast scarlet RWL; Diazo brown BWA; Diazophenyls: blue 8GW, brilliant green G, fast green 2GL, fast green GLN; Diphenyls: brown BBN supra I, fast blue 10GL, fast blue green BL, fast brown 2RL, fast orange GRW, fast orange 3RL, fast red GL; Fast jet black 2BRE.

Lumicrease green 3LB, yellow 3LG; Paper fast bordeaux B; Pyrazol fast orange GLL; Rigan sky blue G; Sella fast black FF; Sirius: black L, supra brown G; Solar: blue FGL, blue 2GLN, brown RLN, discharge orange 3LG, grey 2BL; Solophenyls: bordeaux 2BL, brown BL, brown GL, brown GRL, brown R1, dark green GBL, grey 4GL, olive GL, orange 2RL, red 4BL; Viscolan fast brown 3G.

MISCELLANEOUS UNCLASSIFIED DYES

Bleachers' tint; Fast leather dark blue BR; Leucophor: B, BS, WS; Luxanchol red R.

Medicinals

Acetarsol, sodium thialbarbitone.

Other Finished Products

Chemicals, photographic, coal tar, irgatan LV.

NON-COAL TAR DRUGS, AND HERBS, LEAVES, ROOTS OR OTHER ARTICLES NOT IN MEDICINAL DOSES

Aloin, ascorbic acid (vitamin C), imported in other than medicinal doses, atropine-methyl nitrate, atropine sulphate, calciferol (vitamin D-2), calcium lactate, chloral hydrate, cortisone acetate, desoxycorticosterone acetate, digitoxin, ephedrine hydrochloride, natural, estrone, ethinyl estradiol, hyoscyamine hydrobromide, hyoscyamine sulphate, licorice extract in paste, rolls, or any other form, lobeline hydrochloride, khellin, methyl testosterone, mustard oil, genuine nucleic acid, physostigmine sulphate, pilocarpine hydrochloride, pilocarpine nitrate, rauwolfia extract, rutin, scopolamine methyl nitrate, testosterone, testosterone enanthate, testosterone propionate, theophylline, imported in other than medicinal doses, thymol, vitamin B-1 hydrochloride (thiamine hydrochloride) (B-thiazol compound), vitamin B-6 hydrochloride (pyridoxine hydrochloride).

INDUSTRIAL CHEMICALS

Aluminium chloride, anhydrous, ammonium difluoride, ammonium persulphate, brucine alkaloid, brucine sulphate, chalk, whiting, or paris white, precipitated, chemical products chiefly used as assistants in preparing or finishing textiles, chlorine, liquid, chlorophyll, decyl alcohol derived from coconut oil, ergosterol unirradiated, ethyl silicate, eucalyptol.

Lauryl alcohol, derived from coconut oil, not sulphated, nicotine alkaloid, nicotine sulphate, ore, manganese, activated, peroxide, hydrogen, potassium chromium sulphate (chrome alum), potassium metabisulphite, potassium persulphate, resin, synthetic, polythene, sodium alginate, sodium perborate, trichloroethylene, vinyl acetate, unpolymerised.

PIGMENTS, PAINTS AND VARNISHES

Acetylene black, carbon black, in paste form, chrome yellow, chrome green (chromic oxide), and all other chromium colours, paint, temperature indicating, pigments, synthetic, iron oxide or iron hydroxide.

MISCELLANEOUS

Colorimeters and polarimeters, machines, centrifugal, and parts thereof, other than cream separators, for separation of liquids and solids, calcium metal, in crowns, flattened, apparatus, laboratory, for analytical determination of gluten, balances, analytical, and parts thereof, electrophoresis equipment, instruments and parts, laboratory, sound measuring, instruments, laboratory, dissecting, machines, therapy, ultrasonic, and accessories, mills, laboratory, thermobalances, laboratory, insulating articles and products, electrical, high density, not laminated, composed of wood flour and having a synthetic resin or resin-like substance as chief binding agent, polyisobutylene, powder, ficin, powder, rubber, chlorinated, rubber, synthetic.

GEC Design Small Graphite Moderated Reactor

LATEST project of the General Electric Co. Ltd., Magnet House, Kingsway, London WC2, announced in a booklet, 'GEC Atomic Power Achievement', sent to shareholders, is the design of a small graphite moderated reactor using enriched uranium fuel, suitable for a 50 to 100 mW power station. Considerable export possibilities are envisaged for the project. Cost is estimated as being competitive with diesel generators.

In collaboration with the UK Atomic Energy Authority, the company is investigating the usefulness of beryllium. Also being considered are ceramic fuel elements, which would be able to withstand high temperatures. A future project is the use of organic liquids for cooling or for cooling and moderating reactors.

Carriage of Dangerous Goods by Rail

AN ENGLISH translation of annex I to CIM, the international convention concerning the carriage of goods by rail, has now been published by the Stationery Office, price 7s 6d.

Annex I is regarded as the standard continental European code for the transport of dang rous goods. Exporters packing such goods for the Continent in the prescribed manner should experience no delay in having them accepted for onward carriage there.

Negotiations are in hand through the Economic Commission for Europe with the aim of reaching similar agreements for other forms of inland transport. A similar agreement for the carriage of dangerous goods by road is on the point of completion and will probably be opened for signature by the end of this month.

Will

DR. THOMAS KENNETH HANSON, Woodbridge, Suffolk, head of the chemistry department of Fisons's Levington Research Station, formerly research manager of Esso Development Co., left £1,080 net.

Overseas News

FIRST-EVER LINEAR POLYTHENE PLANT IN CANADA PLANNED BY DU PONT

PLANS TO construct a plant to make linear polythene have been announced by Du Pont of Canada. A site at Moore Township, south of Sarnia, Ontario, has been chosen for the plant where the polymerisation of ethylene and compounding of the finished product will take place. Pending completion of engineering design work, no estimate has yet been given of the cost of the plant or the number of employees.

Linear polythene is commercially new to Canada, and Du Pont have devoted two years at their research centre at Kingston, Ontario, to the development of it. In the US, E.I. Du Pont de Nemours and Co. have had a semi-works unit in operation for more than a year.

Physical properties superior to regular polythene are claimed for linear polythene. They include improved chemical resistance, higher softening temperatures and better abrasion resistance. Moulded products such as sterilisable bottles and laboratory equipment, packaged food which can be boiled in the packaging material, rigid and high-gloss unbreakable housewares, shatter-proof and low-permeability containers suitable for packaging cosmetics and pharmaceuticals, are among its estimated applications. Linear polythene can also be used to make transparent flexible film of high strength and high tenacity yarns for rope and for seat covers.

New Polythene Producer

A new company, known as Celene, has been formed in Italy by Edison and Union Carbide for the production of high pressure polythene. Initial production is expected to be at the rate of 10,000 tons a year.

Belgian Phthalic Anhydride Plant Planned

Société Chimique de Selzaete in Belgium, has decided to enter the field of chemical manufacture. The company is due to erect in Belgium a plant for the manufacture of phthalic anhydride, for which it now produces the raw material, naphthalene. It is anticipated that this plant will be in operation before the end of next year This information was announced by the chairman of Burt, Boulton and Haywood Ltd., in a statement to shareholders. This company has a majority interest in the Belgian company.

Phthalic Anhydride in Italy

According to the data collected by the Italian Chemical Industry Association, there are 10 factories in Italy producing phthalic anhydride. There are ACNA (Cengio, near Savona), Barbini (Venice-Murano), Bombrini Parodi Delfino (Colleferro), Carbochimital (Padua), CLEDCA (Padua), Di Vito (Cassina de' Pecchi, near Milan), Ftalital (Scanzorosciate, near Bergamo), Prada (Trent), SILNA (Padua), and SIR (Luino).

The total potential of these plants is estimated at 22,000–25,000 tons a year and they work at the rate of 80–90 per cent of their capacity, producing from 20,000 to 22,000 tons of phthalic anhydride a year. About 12,000 or 14,000 tons are consumed in the country and the rest is exported. During the recent years these exports have been tending to grow, 2,619 tons in 1954, 5,198 tons in 1955 and 6,200 tons in 1956.

Portugal Forms Two Nitrogen Products Companies

Two new companies have been formed in Portugal to install plants for the production of ammonium nitrate fertilisers and of ammonia and gas from petroleum derivatives. Investment in the two factories will amount to about 400 million escudos (£5 million). Annual output is expected to be some 136,000 tons of nitrogen products, valued at 230 million escudos (£2¾ million).

The table shows the rise in the consumption of chemical and, particularly, nitrogen fertilisers over the five-year period 1952/53 to 1956/57:

Year	Nitrogen	Phosphates	Potash	Composts
	Metric Tons			
1952/53 ...	177,400	365,100	9,700	1,180
1953/54 ...	207,700	416,000	11,600	3,240
1954/55 ...	233,700	361,100	12,400	4,190
1955/56 ...	253,600	399,500	14,400	4,410
1956/57 *...	276,300	388,400	14,500	5,630

*Provisional

Titanium Dioxide Plant Planned in Mexico

Industrias Quimicas Basicas de Mexico SA are to build a titanium dioxide factory near Vera Cruz. Technical assistance will be received from the Glidden Co. of the US. Investment in the plant will be 80 million pesos (£2.3 million) of which 55 per cent will come from the Mexican company and Nacional Financiera, and 45 per cent from abroad in credits for equipment to be guaranteed by Nacional Financiera.

President of the new company will be Dr. E. Szomlo, founder and previous owner of Syntex SA. No orders for plant have yet been placed.

Italy Bars Penicillin

As the Italian production of penicillin now exceeds the requirements of the country, the Ministry of Finance in Rome, has issued additional instructions against imports of this product.

High Purity Hafnium Sponge

In successful pilot runs by the US Bureau of Mines at Albany, hafnium tetrachloride has been reduced directly to a high-purity sponge. According to the report, the purity of the product is much higher than that obtained by pressure reduction technique plus iodide purification.

A modified Kroll process is employed whereby hafnium tetrachloride is reduced with a mixture of sodium and magnesium. A new operating technique has been evolved, however: Hafnium tetrachloride, sodium and magnesium are heated in a reactor to 725°C. to 750°C. until all the sodium reacts. When the sodium reaction is complete, the temperature is raised to 850°C. at which magnesium reacts. It is claimed that with the new process, reaction temperatures are lower and rates more uniform than with a straight magnesium reduction. Also, fewer impurities are picked up from the crucible.

The experiments have been carried out with 40-lb. batches. Scale-up to 184 lb. is now being developed.

With zirconium, similar good results have been obtained. An acceptably pure form of zirconium is produced, however, by direct reduction.

Russian Catalysis Research

'Soviet Research in Catalysis' is the title of a comprehensive collection of translations of papers on various aspects of catalysis research by Soviet scientists, which will be published by Consultants Bureau, 227 West 17th Street, New York City, in September 1957. Papers pertinent to the subject of catalysis have been selected by Consultants Bureau from Soviet chemical journals translated by the publisher for the years 1949–55, and are presented in complete English translation, as a collection. 'Soviet Research in Catalysis' comprises 1,672 pages, 262 papers, and may be purchased as a unit for $200.

Ilmenite from Gambia

Shipments of ilmenite, an important raw material used to produce titanium oxide for a wide range of goods from face powder to linoleum, are starting to flow from Gambia, West Africa. Mining of it there has begun after a long period of exploration and planning by the British Titan Products Ltd., and it is confidently expected that a regular source of supply will be developed.

An initial cargo of 4,000 tons has reached the Tees for the British Titan Products works at Haverton Hill.

Colombian Aluminium Plant Being Considered

According to reports an American company is studying the question of building a plant for the production of aluminium ingots from imported bauxite at Cartagina, Colombia.

Poland's Sulphur Production Hopes

According to an East German report, ADN, Poland hopes to become the second largest producer of sulphur in the world after the US by 1970. Geological surveys in the area of the Weichsel River, near Rarnobrzeg, and Piaseczna, have shown that sulphur reserves there total about 95 million tons. Construction of a plant in the area on both banks of the river is due to start later this year.

German Companies to Produce Heavy Water

The design for a heavy water production plant to produce heavy water by a process used in the US and in Norway has just been completed by Pintsch-Bamag, Butzbach.

Farbwerke Hoechst has also started production of heavy water, using a newly developed procedure whereby heavy water is produced at a steady temperature of 418 °F. below zero. Capacity of the plant is 6 metric tons annually.

Heavy water in Germany is priced at about 1s 8d per gramme, compared with the US price of just over 5d. It is reported, however, that Farbwerke Hoechst are certain that they will be able to sell heavy water at this price as there will be no conditions imposed with its sale as are laid down for US heavy water (when US heavy water is bought, US technicians must be admitted to the buyer's premises). Also, West Germany's two reactors which will start operations soon are estimated to require 32 tons of heavy water, more than Germany's present production. Annual supplements of 1.6 tons will be required as well.

It is estimated that if the German atomic programme is completed, 100 tons of heavy water would be required by that country each year.

Israel Potash Production and Exports Up

From the Dead Sea Potash Works at Sodom, 53,000 tons of potash have been exported this year, while some 5,000 tons have been marketed locally. Since the beginning of this year, production has doubled compared with the same period of 1956. Production now averages 7,000 tons a month.

According to the director-general of the works, Major-General Makleff, production last month for the first time was sufficient to meet all running expenses, although interest was not yet being covered out of current earnings.

A stockpiling plant is now under construction and is scheduled for completion in August 1958. Machinery has been ordered for this plant from West Germany.

Photographic Materials Plant in Australia

As part of a £A8 million expansion programme Kodak (Australasia) Ltd. are to build in Melbourne what is described as one of the most modern photographic materials plant in the world. The first unit will be a film manufacturing division costing £A3,500,000 which is expected to be in production by 1959. The company hopes to produce a type of easily processed television film.

Portuguese Ammonium Sulphate Imports Authorised

The Portuguese company of Uniao Fabril, Rua do Comercio 49, Lisbon, has been authorised to import 3,000 tons of ammonium sulphate free of duty to replace a similar quantity made in Portugal and exported by them.

Mexican Chemical Production Figures

Mexican production of caustic soda in 1956 was 25,546 metric tons while imports were 30,160 metric tons. Figures for 1951 were 6,140 and 25,553 respectively. Total consumption of sodium alkalis in 1956, in terms of sodium carbonate equivalent, was 156,739 metric tons.

About 80 per cent of Mexican caustic soda is made by Sosa Texaco SA. Four new plants are being built at Monterrey, Coatzacoalcos, Salamanca and Tampico, two of them by associates of US manufacturers.

Total production of synthetic fibres by Celanese Mexicana SA has more than doubled since 1950. During 1956 production was 7,728 tons of acetate filament, 1,274 tons of short acetate fibre, 3,616 tons of rayon filament, 4,842 tons of short rayon fibre and 276 tons of rayon waste.

In 1956 Mexico produced, in metric tons, creosote 8,200, benzol products 3,860, tar 9,120 and bitumen 6,000. Ethyl alcohol produced from cane sugar was 39.9 million litres in 1956, a decrease of 3.6 per cent compared with 1955.

FD and C Yellows Ban Lifted in US

US Food and Drug Administration orders banning FD and C Yellows, 1, 2, 3 and 4 have been stopped. US industry will now be allowed to discuss the matter in public hearings. Protests have been made by the Certified Colour Industry Committee against the FDA rule on the yellow dyes. Proof is expected to be produced of the harmlessness of yellows 3 and 4.

Objections have also been raised by Hoffman-La Roche regarding the definition of a coal-tar colour which at present includes the company's synthetic β-carotene.

Applications to Indian Patent Office

About 39 per cent of the total number of applications related to chemical industries, the recently published Indian Annual report of the Patent Office for 1955 records. A high proportion of these dealt with phenothiazines, aminophenoxy derivatives and glycan derivatives. Interest was shown in hydro-forming of naphthas for production of valuable petrol-like products.

There was keen interest shown by both foreign and Indian applicants in the field of related alkaloids and derivatives. Patents for antibiotics, such as tetracycline, penicillin, streptomycin and erythromycin were fairly large. Many applications relating to insecticides and fungicides containing sulphur were filed.

Four New Silicon Compounds

Union Carbide Corporation have developed a series of four new silicon chemicals designed for use in the chemical industry. Known as organo-functional silanes, the compounds differ from conventional silicones in that they can react chemically with organic chemicals in the same fashion as other organic chemicals.

According to Union Carbide they can be used to modify properties such as solubility, heat stability and volatility in organic chemical compounds. Applications are, therefore, as modifiers, lubricants, greases, emulsifiers, sizing and finishing agents, synthetic resins and pharmaceuticals.

For production of superior glass cloth laminated with melamine phenolic and epoxy resin systems, there is γ-aminopropyltriethoxysilane. Other organo-silanes can be chemically incorporated, it is claimed, in other industrial plastics resin systems such as polyamide, polyurethane and epoxy resins to produce plastics materials having some unusual properties.

New Dutch Factory to Manufacture Catalysts

Construction of a new factory for the manufacture of catalytic agents and other products has been started by the Royal Sulphuric Acid Factory, formerly Ketjen of Amsterdam. The products will be manufactured on behalf of Esso's refineries outside the US.

The factory will be operated by a company jointly owned by Royal Sulphuric Acid Factory and the American Cyanamid Co. Estimated cost of the factory is Fls. 8 million (£761,905 approx).

Germans to Erect S. Korean Fertiliser Plant

The South Korean President's signature is awaited by Demag, which heads a West German industrial consortium, before they can start building a nitrogen fertiliser plant near Seoul. The contract to build the plant was signed by the South Korean Government and the German partners some time ago. The plant, which is to have a capacity of 85,000 tons a year, will cost DM. 105 million (about £9 million). Payment is to be made in German currency.

Canada's First Quarter Earnings Down

In the first three months of this year the percentage of net earnings and profits to sales in comparison with the first quarters of 1955 and 1956 showed a noticeable drop. Sales were up $19 million but profits were down $2 million. High depreciation charges were the reason for the reduced profits. Petroleum and coal products also show some let-down in business.

Chemical Products	*First Quarters ($ million)* 1955	1956	1957
Sales	240	267	286
Net earnings	30	33	31
Depreciation	10	10	11
Profits before taxes	20	23	20
Profits after taxes	11	14	12
Petroleum and Coal Products			
Sales	398	478	545
Net earnings	47	58	70
Depreciation	16	18	21
Profits before taxes	31	40	49
Profits after taxes	17	22	28

FOR YOUR DIARY

MONDAY, 16 SEPTEMBER

Institute of Metal Finishing—London: Northampton Polytechnic, St. John Street EC1, 6.15 p.m. 'A worthwhile savings scheme for barrel plating' by R. Maling and S. E. Mills.

Institute of Metals—Glasgow: Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, C2. Annual Meeting.

CHEMICAL PIONEERS

10 John Hutchinson of Widnes

The tenth article by Dr. D. W. F. Hardie is a biography of John Hutchinson, the great Victorian alkali manufacturer. With a capital of a few hundred pounds he transformed the village of Widnes, with its 2,000 inhabitants, into the greatest heavy chemical manufacturing town in the 19th century world. He also advocated before Parliament a system of voluntary legislation to remedy the worst features of atmospheric pollution.

THE HUTCHINSONS OF MARYPORT in Cumberland had been simple sea-faring folk for generations. John Hutchinson saw service in the Navy during the Napoleonic Wars and rose to the rank of Captain, before leaving the sea to become a merchant and Lloyd's agent in Liverpool.

Captain Hutchinson's youngest son, John, was born in 1825. Eight years later the Captain died of tuberculosis while on a visit to Cork, leaving his widow, Ann Trenwith, to bring up a family of two daughters and two sons, one of the latter of whom was shortly to die of the same disease as his father. Family tradition has it that young John Hutchinson studied chemistry in Paris; no record confirms this, and it appears more likely that Hutchinson made his first acquaintance with chemical manufacture in a small works near his home in Parliament Street. The Parliament Street chemical works was one of several operated in Liverpool by an extraordinary Schwabian, Andrew Kurtz, who had studied chemistry in Paris under Gay Lussac and Thénard, exhausted himself in America and elsewhere in various chemical manufacturing projects, and had for some years settled in Liverpool to make chromium pigments and borax for pottery glaze.

Eccentric to the point of incompetence in business matters, Kurtz found himself so involved with the alkali firm in St. Helens supplying him with the soda for his borax-making, that he had to assume proprietorship and become an alkali-maker *malgré lui*. In 1841 or 1842, when he was 16 or 17 years of age, John Hutchinson was sent by Kurtz to his Sutton Alkali Works in St. Helens. Here he must have given evidence of outstanding ability, for, when Kurtz died in 1846, Hutchinson took control and managed the firm's affairs, while his friend, Kurtz's son, Andrew George Kurtz, completed his law studies. Kurtz senior had left a cash legacy of £7,000 to his widow, and it appeared that the alkali works might have to be sold to pay it. Uncertainty as to his future employment in St. Helens may have decided Hutchinson, then in his twenty-first year, to become an alkali-maker on his own account.

When Hutchinson established his first works in Widnes in 1847 he can have had command, at most, of a capital of a few hundred pounds. It was, however, a propitious moment to set up in alkali manufacture: the great spurt, which in the next four decades was to produce a five-fold expansion of the trade, had begun and Hutchinson could not have chosen a better site for his enterprise. Widnes, then a village of some 2,000, was at the point where the extension of the Sankey Navigation connected the SW Lancashire coalfield with the Mersey. From across the river water-borne cargoes of salt could be brought to within a few yards of the furnaces that converted it to soda; a railway would shortly bring brimstone and pyrites from Garston and carry back finished alkali for export across the Atlantic, and the marshes provided a dumping ground for the alkali waste, produced at the rate of two tons for every ton of soda made. Within three years Hutchinson was employing a hundred men, who had migrated to the marshland village from St. Helens and Ireland. He felt himself sufficiently secure to embark upon marriage, and in Dublin in August 1851 he married Elizabeth Kynsey. In 1853 he took into partnership Oswald Earle, who had married Mrs. Hutchinson's sister, Georgina. Earle was a general merchant in Liverpool and confined his activities to the commercial side of the business.

Initiative Followed

Hutchinson's initiative in Widnes was rapidly followed by other alkali-makers. Within a decade the banks of the canal were lined by chemical factories. Hutchinson began to acquire land in the immediate neighbourhood, raising it above the flood-level of the Mersey by dumping upon it alkali waste from his own and the other factories. For this disposal service to his fellow alkali-makers he made a charge which brought him an assured and growing revenue, enabling him further to extend his land-buying policy.

In 1855, William Gossage, believing he had discovered a process for recovering sulphur, contracted with the Widnes alkali-makers to purchase their alkali waste. On a large scale the recovery process proved a complete failure. The alkali manufacturers, with the exception of Hutchinson, released the discomfited Gossage from his undertaking. Hutchinson exacted as penalty for breach of contract a long strip of land which Gossage owned near the canal; on this land Hutchinson erected, in 1857, his second alkali works.

By 1859 it was becoming evident that powerful political forces menaced the future expansion of the alkali industry. The landed gentry with the then Lord Derby at their head, contemplated legislation which would make it impossible to carry on the manufacture in agricultural areas and confine it to certain scheduled regions, not necessarily located with due regard to raw materials and exporting facilities.

Hutchinson persuaded his fellow manufacturers to form an organisation with agreed powers to police one another's factories to ensure that muriatic acid absorbing equipment was always in efficient operation and that no surreptitious discharge of the noxious vapour took place under cover of darkness—then an all too frequent expedient. He drew up a detailed set of rules to be stringently adhered to, and, with Henry Deacon, compiled the first statistics of the industry, in order to impress the public and politicians with the importance of the manufacture in the national economy.

It was Hutchinson's view—later fully justified—that if the manufacturers themselves took steps to remedy the worst features of atmospheric pollution by their operations, they would be more likely to avert imposition of legislation framed without consideration to the actualities, technical and economic, involved. Although Hutchinson's self-policing organisation soon fell into abeyance, he was able to cite it in his evidence before the Select Committee of the House of Lords in 1862, as showing the willingness and capability of the manufacturers themselves of effecting the remedy demanded. "It is an old saying," he reminded their Lordships, "that a reclaimed poacher is the best gamekeeper!" The Alkali Act of 1864, the first specific legislation relating to chemical manufacture, with its limited and reasonable requirements from the industry, owed its essential features almost entirely to the timely diplomatic activity of John Hutchinson.

Lord of the Manor

Hutchinson's land purchases, by the early 1860's, ringed round most of the central chemical manufacturing region of Widnes, now grown to a town of some 10,000 inhabitants. By acquiring a wide sweep of 'immemorial leys' along the river shore he became Lord of the Manor of Widnes. He planned a large dock and a system of branch railway lines connecting it with the main line. In laying out these facilities he intended not only to serve industries already in the area, but to attract new enterprises to sites he had established on the millions of tons of deposited waste. John Hutchinson was, in effect, the planner of the first 'industrial estate' in this country. In the two decades following his death, as Widnes rose to the position of being the most important heavy chemical manufacturing town in the world of last century, Hutchinson's expectations were fulfilled.

Hutchinson, like most of the chemical industrialists, was politically a Liberal, aligning himself with them against the traditional landed interest. He was liberal also in the wider sense, a friend to those oppressed by circumstance or tyrannous governments. Although Hutchinson himself contributed nothing to chemical technology, he gave the raw and enthusiastic young German, Ludwig Mond, an opportunity of putting into practice his sulphur recovery invention and of establishing industrial connections in England. For ten years Mond spent much of his time at

(*Continued on page* 415)

Chemist's Bookshelf

PILOT PLANT TECHNIQUES

PILOT PLANTS, MODEL AND SCALE-UP METHODS IN CHEMICAL ENGINEERING. By *R. E. Johnstone* and *M. W. Thring*. McGraw Hill Publishing Co. Ltd. Pp. xi + 307. 71s 6d.

There are few enough books published on chemical engineering topics to make the appearance of a new one an event to be awaited with considerable interest if not eagerness (particularly by reviewers). When a new text does arrive therefore, it is assured of an attention perhaps out of proportion to its deserts and may in addition suffer by its delights being over-anticipated.

All the more reason therefore to welcome the present text which both deserves the attention that it will get and also provides such a technical feast of subject matter as could scarcely fail to please even the most discriminating reader. Its publication is timely coming as it does so soon after an authoritative conference on the subject of scale-up (see CHEMICAL AGE, 1 June, p. 215)—a meeting which marked a revival in the once highly regarded but latterly demoded art of pilot plant practice.

The authors begin with a justification of pilot plant experimentation and its allied and newer development of model theory. There follow several chapters dealing with general theory concepts and definitions concerning the principle of similarity, dimensional analysis and associated differential equations for the basic chemical engineering operations of momentum, heat and mass transfer. The 'regime concept' is then introduced and the analysis of any particular operation to discover whether the controlling regime is chemical or dynamic is explained. Many examples of the technique are given together with general rules of application of the analysis to scale-up experiments.

In the latter half of the book are detailed applications of the general principles elucidated earlier to a number of common unit operations and equipment including ducts, filters, heat exchangers, packed towers, mixers, reactors and kilns. There is an important chapter on the use of these techniques enumerated in this book in the investigation of corrosion problems. The concluding chapter details in a most interesting manner the development and applications of mechanical, hydraulic and electrical analogues for some of the more complex chemical engineering problems, particularly those involving unsteady state conditions. A useful appendix includes comprehensive lists of dimensions of physical and chemical quantities and dimensionless groups.

This book is a valuable addition to the literature of the profession. It is a 'must' for the library of all who share in the new analytical and quantitative approach to chemical engineering, being a scholarly text in keeping with this new outlook and symptomatic of the growing status of the subject.

D. C. FRESHWATER

Statistical Methods

STATISTICAL METHODS IN RESEARCH AND PRODUCTION (With Special Reference to the Chemical Industry). Edited by *Owen L. Davies*. 3rd edition revised. Published by Oliver and Boyd for Imperial Chemical Industries Ltd. Edinburgh. 1957. Pp. x + 396. 45s.

This is the 3rd edition of this now well-known handbook on statistical methods. The new edition fully maintains the high standard of the earlier two, both in the clarity of exposition and the choice of topics, although in this latter respect the reviewer feels that a disproportionate amount of space has been allocated to regression and correlation; 123 pages out of a total of 355 pages of text weights the book rather heavily in this direction.

For those readers to whom this book is not familiar in its earlier editions, one can say that it is a thoroughly good handbook on statistical methods. The emphasis is on the practical aspects of the work, with due attention given to the underlying assumptions required by the theory. A large number of examples are given, with full details of their working included in appendixes to the chapters; these examples are drawn from actual practical problems met with in the chemical industry, but the book may be read with profit by members of other industries for the basic principles of the techniques used are clearly described. Written by a team of chemists, statisticians, engineers and physicists, the result is an invaluable work of considerable practical value.

There has been considerable revision for this new edition, involving not only the addition of new material but also a different treatment of certain topics.

Throughout the book, the emphasis is now on confidence limits rather than significance tests, a change which is to be welcomed, since confidence limits seem intrinsically to be the more easily understood. There is also a small, yet important, difference in style; the bold appearance of the diagrams and formulae in the 2nd edition has been replaced by smaller diagrams in lighter print, and by formulae in small Greek and English symbols, instead of the former English capitals. This is a pity, since much of the force of presentation has thus disappeared.

The book, generally, makes no demands on the reader's mathematical knowledge, except that the large additional chapter on multiple and curvilinear regression assumes a knowledge of matrix algebra.

A comprehensive section of tables and a good index round off this very well-produced volume, which should have a place in the library of all who use statistical methods.

M. H. KREPS

Chemistry of Chlorophyll

LIGHT, VEGETATION AND CHLOROPHYLL. By *J. Terrien*, *G. Truffaut* and *J. Carles*. Hutchinson and Co. (Publishers) Ltd. 1957. Pp. 228. 15s.

This is a publication in a single volume of 'Lumiére et Vegetation' by J. Terrien and G. Truffaut and 'L'Energie Chlorophyllienne' by J. Carles. Excessive overlapping has been avoided, it is claimed, by omitting the less explicit of any two passages covering the same ground.

Part I, 'Light and vegetation' discusses, among others, light and thermal radiations, solar radiation, the photometry of the leaf, the roles of infra-red, ultra-violet and visible radiation, photosynthesis, theories of assimilation, the analogy between photosynthesis and photography, phototropism and photoperiodism.

The relation between chlorophyll and energy is the subject of the second part of the book. After the account of the chemistry of chlorophyll and of photosynthesis and a description of the part played by chlorophyll in the assimilation of substances by the plant, the author, J. Carles, deals, in his final chapter with 'Chlorophyll and ourselves'. He mentions some of the more obvious applications of chlorophyll derivatives—deodorisers and bacteriostats—and discusses the economics of obtaining energy from chlorophyll. By comparing the hydro-electric energy obtained from a dam with the energy obtained from the same quantity of water if used to grow maize the author shows that chlorophyll can give up to a hundred times more energy. Irrigation is therefore a hundred times more economic than the generation of electricity.

J.P.S.J.

Fine Particles: Physics and Other Aspects

PARTICULATE CLOUDS: DUSTS, SMOKES AND MISTS. Their physics and physical chemistry and industrial and environmental aspects. By *H. L. Green* and *W. R. Lane*. E. & F. N. Spon Ltd., London. 1957. Pp. 425 and 8 plates. 70s.

Chemical manufacturers are only too familiar with dusts, smokes and mists in process gases as well as in discharges to atmosphere. Knowledge of the fundamental laws governing their characteristics as well as their production and collection is of prime importance in both process control and research. Study of particulates has been continuous at Porton since its establishment 40 years ago and has been a major interest of Mr. H. L. Green for more than three-quarters of that period. He and his colleague, Mr. Lane, have now distilled their vast knowledge on the subject into a convenient volume.

They have succeeded in giving a systematic treatment of the results of investigations in many scientific disciplines ranging from

pure physics to applied chemical engineering and medicine, and though the emphasis may be coloured in places by their own experience, few specialists will find omissions of consequence. Many scientific committees have had the benefit of Mr. Green's membership and there is no doubt that the interchange of experience and ideas thereon has assisted the authors in their treatment.

Two-thirds of the book are devoted to the physics of fine particles including the theory of their production and coagulation, their optical and electrical properties, methods of determination of size and concentration and the theories of deposition and filtration. There is also a chapter on the theory of diffusion of particles from chimneys. The descriptive material is sufficient for specialists but is not intended for those unfamiliar with the subject. The mathematical treatment is clear but concise, symbols are carefully defined and many numerical examples are given. The extensive references include many to Government reports, some unpublished.

The remaining third of the book deals in less detail with industrial aspects including collection of particles, health hazards and atmospheric pollution. Uses of particulate clouds are briefly described. The descriptive chemical engineering in this part of the book is inevitably scanty though usefully critical.

Summarising, this volume will remain an essential reference book for many years to all who work with fine particles.

G. NONHEBEL

Practical Formulae

THE CHEMICAL FORMULARY. Edited by *H. Bennett*. Vol. X. Chemical Publishing Co. Inc., New York. 1957. Pp. 392.

Under the editorship-in-chief of Mr. Bennett, technical director, Glyco Products Co. Inc., a board of 54 editors has assisted in the compilation of this book which describes processes for making products ranging from adhesives to textile additives.

The treatment throughout is extremely practical, and no attempt is made to discuss the theory behind any of the processes described.

Presumably because of the amount of tabular matter included, the book has been set in two column style which, unfortunately, results in a rather unattractive appearance.

J.P.S.J.

Glass-Plastics Revised

GLASS REINFORCED PLASTICS. Edited by *Phillip Morgan*. Published for *British Plastics* by Iliffe and Sons Ltd., London, 1957. Pp. xv + 276. 45s (by post 46s 6d).

When it first appeared in 1954 this book was an immediate success on both sides of the Atlantic. The second edition, now available, has been brought up to date. Several chapters have been completely rewritten or heavily revised and three new chapters have been added.

All the important resins are dealt with, but polyesters, being most widely employed, are described in more detail than other resins. There are 18 chapters, covering the whole range of the subject. The authors are men who are well known in their respective fields.

J.P.S.J.

Chemist's Bookshelf

Rubber Technology

RUBBER, FUNDAMENTALS OF ITS SCIENCE AND TECHNOLOGY. By *Dr. Jean Le Bras*, translated by *Irene E. Berck*. Chemical Publishing Co. Inc., New York. 1957. Pp. 464. $12.00.

This volume, the author's first to be published in English, contains a comprehensive but concise survey of the theoretical and practical aspects of rubber science and technology.

A brief but interesting chapter on a general and historical survey, showing the growth of the rubber producing and manufacturing industries to their present status, is followed by an account of the sources and preparation of raw rubber and the analysis and properties of latex. Mention is also made of synthetic latices and their properties. The physical and chemical properties of rubber are very well described, and also the theoretical aspects of the structure of natural and modified rubbers. The author's interpretation of the theory of vulcanisation with the effect of accelerators is extremely interesting and well written.

The chapter on the principles of compounding is short but adequate, and a useful set of formulations included give practical examples of the application of these principles. The processing of rubber and latex is very ably dealt with and liberally illustrated with diagrams and photographs of up-to-date factory processing equipment. It is also enhanced by some valuable practical details of many industrial processes and indicates the author's intimate knowledge of modern factory practice.

Synthetic Rubbers

Synthetic rubbers play a prominent part in this volume, and some very useful information is given on the modern methods of preparation, the properties and compounding of the principal types in use at the present time.

A valuable section on laboratory chemical and physical testing methods for rubbers is given, and examples of testing equipment are shown, but unfortunately the illustrations do not show the latest designs in all cases.

A noteworthy feature of this publication is a chapter on hard rubbers and reclaim, about which so little has been written in books of this type. This indicates the author's appreciation of their growing importance particularly of hard rubber for use in such applications as chemical plant, etc.

A final chapter on the uses and applications of rubber merits mention, in that it illustrates the less usual, and more specialised applications of rubber, and this chapter may well be a source of inspiration to manufacturers.

Dr. Le Bras has not omitted to pay tribute to other writers in the field of rubber science and technology, for in addition to the numerous references at the end of each chapter, several pages are devoted to a general rubber bibliography, where reference is made to many valuable works which have been published during the past 30 years.

As a technical publication, this volume has been published in a very readable form, and here tribute must be paid to the translators. It is a book which will undoubtedly prove to be a valuable addition to a rubber technologist's library, whether he is engaged upon research, development or factory processes.

L. BOTTOMLEY

CHEMICAL PIONEERS *(from page 413)*

Hutchinson's works; there he met John Brunner, then a £2-a-week bookkeeper in Hutchinson's office, who was to be his partner in the enterprise which introduced modern alkali manufacture into this country. On the eve of Hutchinson's death arrangements were in train for formation of a new concern—Hutchinson and Mond. Had the Widnes pioneer survived, say, to his sixtieth year, instead of only to his fortieth, much would have been different in the relative significance of the personalities in the evolution of the alkali industry. In later years both Brunner and Mond spoke of their debt to Hutchinson. Mond said of him: "He was the cleverest man I have ever known."

Towards the end of 1864, the disease which had brought premature death to Hutchinson's father and brothers, was rapidly destroying his own vitality: the self-assured young industrialist who had promised himself a career in Parliament in his mature years had been transformed into a haggard old man with a wispy Charles Dickens beard. It seemed to him that possible ruin was ahead for the industry he had established, for the American Civil War had greatly reduced the alkali export trade. On Friday 24 March 1865 John Hutchinson died, unaware that the depression was ending.

On the Sunday following Hutchinson's death the curate of Widnes, preaching on the suggestive text, 'What shall it profit a man . . . .', told his flock that 'the name of John Hutchinson will not cease to be remembered in Widnes." That prophecy has not proved false, but Hutchinson deserves a place not only in local recollection but in the wider annals of British industrial history.

Synthetic Detergents

In a review of 'Synthetic Detergents' by P. A. R. Puplett (see CHEMICAL AGE, 17 August, p. 259) it was said that 'Nearly one half of the book is devoted to the household market which in 1955 accounted for 475,000 tons of synthetic detergents'.

This should have read '475,000 tons of soap and synthetic detergents or 162,000 tons of synthetic detergents'.

Products for Chemical Industry shown at Olympia

THE following review of exhibits at the Engineering, Marine, Welding and Nuclear Energy Exhibition which closed at Olympia on 12 September, completes our report of the exhibition (see also CHEMICAL AGE 7 September, p. 365).

Rotary Oil Compressors

Chemical pumps made in Worthite and 18/8/3 stainless steel for handling acids, alkalis and slurries were shown by *Worthington-Simpson Ltd.*, Lowfield Works, Newark-on-Trent. Also exhibited for the first time were two machines from the new range of Worthington-Simpson two-stage, oil-cooled rotary air compressors of the industrial type covering capacities from 200 to 1,200 cubic feet per minute at pressures up to 120 lb. per sq. in. Basically similar to the conventional sliding-vane type of compressor, they differ in that large quantities of oil are injected. This is stated to not only ensure complete lubrication of all working parts, but to form an effective seal against air leakage between the sliding vanes of the rotor enabling a high volumetric efficiency to be obtained. Also the air acts as an internal coolant absorbing a high proportion of the heat of compression so that the final air temperature is below 200°F. The absence of valves and reciprocating parts provides for smooth running free from vibration and pressure pulsations. A light and simple type foundation can be used.

Rolling Mill Bearings

On the stand of the *United Steel Co. Ltd.*, 17 Westbourne Road, Sheffield 10, attention was drawn to a new development in rolling mill bearings. The bearings have been produced from a new synthetic resin by United Coke and Chemicals, a United Steel subsidiary and excellent results are claimed for them.

Explosion-Proof Motors

A feature of the stand of *Newman Industries Ltd.*, Yate, Bristol, was an electric motor labelled 'Explosion proof—approved by American Underwriters Laboratories Inc.' The company believe that their range of explosion-proof motors from ½ to 30 h.p. is the only one, outside of Canada and the US, to have had such approval.

Also shown was the firm's new drip-proof range of motors from ½ to 50 h.p. built to the new draft BS with Class E insulation and permitting a 65°C. temperature rise; totally enclosed motors, and flameproof motors certified by Buxton for gas groups I, II and III.

Hollow Ram Attachment

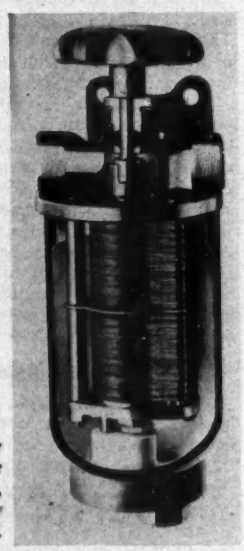
A new Porto Power hollow ram attachment was being shown by *E. P. Barrus (Concessionaires) Ltd.*, 12–16 Brunel Road, Acton, London W3. Main feature of the hollow ram, which is operated by the standard Porto-Power hydraulic pumps, is its ability to exert full plunger pressure at either end.

Another new Porto-Power development is the production of an electrically-powered hydraulic pump giving a steady flow of power for fast, continuous or intermittent operation of any of the Porto-Power rams or for any hydraulic system, requiring up to 10,000 lb. p.s.i. pressure. This pump is now being made in Britain for the first time.

Self-Cleaning Filter

A new product of *Zwicky Ltd.*, Slough, Bucks., is the Zwikleen self-cleaning filter. The range is from ½ in. to 2 in. connections; the smaller sizes are either screwed BSP or UNF while the 1¼ in., 1½ in. and 2 in. are flanged. Three stages of filtration may be arranged to give aperture sizes of .003 in., .006 in. and .010 in.

The filter body and sump are manufactured in light alloy for the screwed sizes and in cast iron for the larger flanged type. The internals are manufactured in steel and the filter may be used with the full range of hydrocarbons.



Self-cleaning filter, the Zwickleen, made by Zwicky Ltd.

Filtration is of the edge type, the element being built up of hollow steel discs, separated by spacers of a given thickness. Steel knives are arranged between the discs in such a way that one full turn of the external handle completely removes all impurities which drop into the bottom of the sump. When it is necessary to remove the sump for cleaning, the complete element is withdrawn with the sump.

Screen Air Filters

Vokes Ltd., Henley Park, Nr. Guildford, Surrey, displayed a representative selection of their complete range of products. Foremost among the new products was the Auto-Roll, an automatic screen type air filter for air-conditioning and ventilating systems which has its medium disposed between two rollers so that replacement of the dirty cloth is effected by a few turns of the lower roller. A similar filter is the S.C. type which is another automatic rotating screen of wire mesh panels with an in-built oilbath; this offers reasonably high efficiency under heavy dust concentrations with no servicing requirement.

A new development in lubricating oil filter elements was on show. These units designated VAF 66 are stated to offer greater flow/lower resistance characteristics. According to Vokes the unit's inherent strength renders the usual wire mesh unnecessary thereby allowing a greater active filtering area in an extremely compact space.

Of great interest to maintenance engineers was the 'dirty element warning indicator' for large capacity fluid filters which gives ample warning of the need for replacement of the element before by-passing or excessive pressure drop occurs.

Welding Installations

A number of new complete welding installations was shown by *Quasi-Arc Ltd.*, Bilston, Staffs, including a model of the new Girth seam welder for the automatic welding of large storage tanks; a section of the internal welding boom which incorporates television equipment used to guide the welding head; and the finger type backing bar jig, designed to facilitate the welding of longitudinal seams in material thicknesses ranging from 0.015 in. to 0.1 in.

Power-Operated Doors

G. D. Peters and Co. Ltd., Windsor Works, Slough, exhibited power-operated doors, demonstrating the action of gliding and folding doors, pneumatically and electrically operated. Compressed air, vacuum and electrical operations are catered for, and there are numerous methods of control available. Also shown was a range of electrodes.

Compressors

Reavell and Co. Ltd. were showing a selection of their standard types of air and gas compressors, including a two-stage double-acting vertical compressor of 1,500 cu. ft. per minute capacity for pressures up to 120 lb. p.s.i. A quadruplex compressor which is a single-stage machine of 240 cu. ft. per minute capacity for 120 lb. p.s.i. and a number of single-stage, two-stage and three-stage single-acting vertical compressors designed for various pressures.

New Exhibitors at Birmingham Exchange Centre

New exhibitors at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham, include the Permali group of companies who are showing Permaglass, a glass fibre reinforced plastic based on polyester, expoxide, phenolic and melamine resins. It is said to be chemical resistant with good dielectric properties. This group is also showing Permali laminated plastics made from thin wood veneers and Dialem a synthetic resin bonded with paper and fabrics into tubes. Marglass Ltd., Sherborne, Dorset, another new exhibitor, show the advantages of their glass fabric for industrial uses. It is available coated with Neoprene, p.v.c., Terylene, Courlene and nylon.

PEOPLE in the news

● New directors of the Monckton Coke and Chemical Co. are MR. O. R. GUARD and MR. W. ROBINSON Both are directors of Ocean Wilsons (Holdings) which holds through subsidiaries more than 50 per cent of the issued share capital of the Monckton Co. MR. D. H. CURRER BRIGGS, a director of Monckton Coke and Chemical Co. has resigned from the board. Mr. Briggs has served the company for a long period of time.

● New sales director to the board of the Wellcome Foundation is DR. FRED WRIGLEY.

● The British Association have elected SIR ALEXANDER FLECK to be their president for 1958. He is to be installed in London on 3 January and will preside over the next annual meeting which will be held in Glasgow.

Sir Alexander Fleck

Sir Alexander has been chairman of ICI since 1953. Born in Glasgow in 1889, he started work as a laboratory boy at Glasgow University, became a full-time student and gained a chemistry degree at the age of 22. By 1913 he had his own research laboratory as physical chemist to the Glasgow and West of Scotland Radium Committee.

During the first world war he joined the Castner-Kellner Alkali Co., which became, in 1920, a subsidiary company of Brunner, Mond and Co. This company merged into ICI in 1926 and by 1931 Sir Alexander had risen to be managing director of the general chemicals division of ICI. Six years later he was appointed chairman of ICI (Fertiliser and Synthetic Products) Ltd. He joined ICI's main board in 1944 and became deputy chairman in 1951.

● MR. WILLIAM FIDDES has been appointed special technical representative by Walker, Crosweller and Co. Ltd., Cheltenham, for their Arkon products, which include gas flow recorders, pressure and vacuum recorders, remote reading instruments and flow indicators. Mr. Fiddes, who is an Australian, was trained at Broken Hill Proprietary Steelworks Co. Ltd., Newcastle, NSW.

● Two new appointments are announced by Chemstrand Ltd., 8 Waterloo Place, London SW1. MR. JOHN CANNON, editor of *Work Study and Industrial Engineering* and Press and publications officer of the Industrial Welfare Society, has been appointed advertising and public relations manager. MISS PAMELA BAUGH, London representative for the 'tested quality scheme' of Courtaulds Ltd., has been appointed fashion publicist for Acrilan acrylic fibre. From 1952 to 1956 she served with the British Man-Made Fibres Federation.

● Three Chinese officials from the Ministry of Chemical Industry in Peking who have been touring UK chemical and plastics plants are MR. HSU, MR. NI, and MR. CHIN. Among factories visited, at their own request, are BIP Chemicals, Birmingham, ICI plastics division, Welwyn, Petrochemicals, Partington, and EK Cole Plastics, Southend-on-Sea. The visit was arranged through the Federation of British Industries.

● MR. ROBERT EATON, manager of the fatty acid department of Price's (Bromborough) Ltd., Bromborough Pool, New Ferry, near Birkenhead, has retired after nearly 52 years service with the company. His retirement marks the end of an era,

J. Arnold Fox, chairman (left) makes the farewell presentation to Robert Eaton

since only last month Price's announced the closing of the old pressing process for the manufacture of oleines and stearines, a process with which Mr. Eaton had been associated for many years. The company's oleines and stearines are now produced exclusively by the Emersol process of solvent separation. Mr. Eaton was presented with an electric mower by MR. J. ARNOLD FOX, chairman.

● Winners of the sports day events at the British Pharmaceutical conference were: Edmund White Cup for golf: E. ROBINSON, Bradford, with a net score of 65 (81 less 16); runner-up, DR. H. DAVIS, 73 (86 less 13); scratch prize, L. N. FLOCKHART, Ramsgate.

Jephcott Cup for tennis: R. T. HAWKSLEY, Melbourne, and MISS P. A. GRIGG, East Grinstead; runners-up, W. J. EDWARDS, Exeter, and MISS I. LUMB, Warlingham.

London Challenge Bowl for bowls: R. BIRRELL, Giffnock, and W. PEEBLES, Glasgow; runners-up, DR. F. J. ELLIOT, Edinburgh, and S. C. HIGGS, Mortlake.

● MR. F. J. ERROLL, Parliamentary Secretary to the Board of Trade, is to visit Burma, Hong Kong and China. He will leave England on 25 September by air and return about the end of October. During his tour, Mr. Erroll will explore the possibilities of increasing trade with Burma and China. He will have discussions with the governments of those countries and with the Hong Kong Government, as well as with merchants and trading organisations.

A Chinese technical trade mission is visiting the UK at the end of this month at the invitation of the Sino-British Trade Committee and firms wishing contact with the mission are advised to get into touch with the special China Trade Mission Liaison Office at 21 Tothill Street, London SW1.

Water Research Association to Discuss Work

A DISCUSSION on the work of the Water Research Association will be held at the Royal Society of Arts, Adelphi, London WC2, at 2.30 p.m. on 16 October following the annual general meeting of the association.

In the chair will be Mr. Norman J. Pugh, engineer and manager, Coventry Corporation Waterworks and chairman of the research advisory council.

Topics of discussion will be: 'Acoustics and leak detection' by F. R. Jones, 'Colloid science and coagulation' by R. F. Packham, 'Polymer physics and plastics pipes' by D. A. Gill, 'Research and the information service' by J. L. Robinson and 'Co-operative research and the water industry' by R. G. Allen.

Limited accommodation for non-members will be available. Early application for admission should be made to the association at 18 Linkfield Lane, Redhill, Surrey.

Obituary

MR. ROBERT ERNEST KING, commercial manager of the ICI Ardeer works, Ayrshire, until his retirement in 1947, died at his home in Southport a few days ago aged 71. He joined the staff of Roburite and Ammonal Ltd., Gathurst, in 1913 and became secretary of the three companies—Roburite and Ammonal Ltd., British Detonators Co. Ltd. and Lancashire Explosives Co. He was appointed commercial manager at Ardeer in 1929.

MR. A. P. DAVSON, A.R.C.S., F.C.S., F.R.I.C., aged 83, at Painswick, Glos., on 1 September. Mr. Davson was formerly a public analyst and an official agricultural analyst.

Commercial News

50 Per Cent More Output Is Aim of Triplex Subsidiary

FIFTY per cent more production by the end of 1957, the aim of Quickfit and Quartz Ltd., Stone, Staffs, was referred to by Sir Graham Cunningham, chairman and managing director of the Triplex group, in the company's annual report for the year ended 30 June.

The need for this prodigious increase is attributed to the fact that development of new apparatus and assemblies is proving popular with education authorities and training organisations. While overseas orders show a gratifying increase, the company continues to supply a growing number of customers at home in research and industry.

In his report on QVF Ltd., Fenton, Stoke-on-Trent, Sir Graham reported that the Canadian market in particular was beginning to establish itself. Large orders for pipeline had recently been received, one of them running to some 2½ miles of 3-in. pipeline.

The financial year saw the completion of the first full year of operation of the German company, QVF Glastechnik GmbH, the sales from which had exceeded all expectations. Sir Graham added that there is every reason to look forward to this company's continued expansion and development.

Group trading profits during the year were £622,245.

Powell Duffryn

Profits for Powell Duffryn Ltd. for the year ended 31 March were £2,036,250 (£1,869,947). A final dividend of 10 per cent making 16 per cent (same) is proposed on ordinary. In his annual statement, Sir Henry Wilson Smith, chairman, said that the profit element of Powell Duffryn Carbon Products, mainly engaged in the manufacture of heat exchangers and chemical equipment in graphite, was still too narrow, but results had improved since reorganisation four years ago. Contrary to certain reports this company had not embarked on the production of nuclear graphite. Carbon Products were, however, undertaking certain research and development work on manufacturing problems and it was too soon to say whether it would proceed beyond this stage.

James Woolley Sons and Co.

A lower net profit of £11,355 (£15,642) is reported by James Woolley Sons and Co., manufacturing chemists, for the year ended 31 March last. A dividend of 2½ per cent is being paid compared with 7½ per cent last year. Group current assets are £804,021 (£828,467) including stocks valued at £364,405 (£349,264). There is a bank overdraft of £65,299 (£86,196).

Lafarge Aluminous Cement

Record sales are reported by Lafarge Aluminous Cement for the year ended 31 March 1957. Reporting this, the chairman, Mr. J. G. Kay, stated that these sales were due to the company exporting to certain markets outside its recognised territory. The exports must therefore be regarded as temporary. Satisfactory home market sales continue.

Trading profits fell from £281,841 to £257,350. Net profits declined from £76,839 to £59,806. A final dividend of 30 per cent is announced, making 40 per cent for the year (same for 1955–56).

African Explosives

The directors of African Explosives and Chemical Industries Ltd. propose to capitalise £5 million in a scrip issue of five million £1 ordinary shares. African Explosives is an associate of De Beers Industrial Corporation and ICI (South Africa) jointly.

Canadian Chemical and Cellulose

Canadian Chemical and Cellulose Co. Ltd. and subsidiaries report a net loss of $1,468,000 (net profit $311,000) for the six months ended 30 June. Net sales were down 4.8 per cent, $18,688,000.

The decline in operating expenses is stated to be the result of a number of factors. Pulp operations showed the biggest decline. The volume of chemical and cellulose acetate exports was reduced by import and exchange restrictions in certain markets and by increased competition in others. Textile markets showed little improvement, while those for lumber were seriously depressed. Alterations and additions to manufacturing facilities have gone forward and give promise of 'significant improvements' in the later months of the year.

Shawinigan Water and Power

The chemical companies owned by and affiliated with the Shawinigan Water and Power Co. experienced good sales results in the first six months of this year compared with corresponding period of a year ago, although results were affected by higher costs, according to a report by Mr. J. A. Fuller, president of the parent company.

Sales by the wholly-owned Shawinigan Chemicals during the first half-year were somewhat higher than in the same period of 1956. Production costs, however, have risen owing to increases in freight rates and costs of raw materials and higher wages. In addition, selling prices in both domestic and export markets which are based on prices of chemicals produced in the US have been adversely affected by the high premium of the Canadian dollar. These factors have resulted in a decrease in net profit as compared with first half of 1956.

The premium on the Canadian dollar is having a similar effect on the business of Canadian Resins and Chemicals Ltd., and manufacturing costs have also increased. Net earnings for the period are lower than for the first half of 1956. BA Shawinigan have completed the extension of their plant in Montreal East and earnings for the period show an increase over last year.

St. Maurice Chemicals have shown some improvement in sales and earnings, but competition from imported materials has become more severe owing to the discount of US funds. Sales and earnings of Shawinigan Resins Corp., Springfield, Mass., US, for the half-year have been maintained. The new vinyl acetate plant of Hedon Chemicals, at Hull, England, is operating satisfactorily.

MORTGAGES AND CHARGES

BAXENDEN CHEMICAL CO. LTD., 13 August. Mort. and deb. to District Bank Ltd., securing all moneys due or to become due to the bank.

DUOSWAN CHEMICALS LTD., 12 August. £1,500 charge to Block and Anderson Ltd.

SATISFACTION

FISONS PEST CONTROL LTD., Felixstowe. Satisfaction 14 August of £3,200 registered 15 January 1953 and £3,216 and £2,052 registered 28 October 1955.

NEW COMPANIES

ADCRETE LTD. Cap. £1,000. To acquire a secret formula to render cement weatherproof and impervious to the elements; manufacturers of and dealers in chemicals for application in the processing of concrete and in cementation for building and structural engineering work, etc. Directors: S. C. and J. Greatrix. Reg. office: 121/3 Church Hill Road, Handsworth, Birmingham 20.

AERO CHEMICALS LTD. Cap. £1,000. Manufacturing, research, dispensing and analytical chemists and druggists, etc. Directors: S. E. Manser and W. B. Hanley, 'Tip Trees', Cheapside, Woking, Surrey.

ANDERSON, JENKINS AND CO. LTD. Cap. £100. Merchants, exporters and importers of chemicals and chemical products, etc. Directors: M. C. Anderson and A. Jenkins. Reg. office: 64 Queen Street, Glasgow.

ALEXANDER BOYD AND CO. (EDINBURGH) LTD. Cap. £10,000. Manufacturing chemists, soap and disinfectant manufacturers, dealers in and agents for chemicals, etc. Directors: G. A. T. Walton and J. M. Walton. Reg. office: 18 Murieston Lane, Edinburgh.

CTR PRODUCTS LTD. Cap. £500. Manufacturers of and dealers in chemicals, drugs, medicines, etc. Directors: R. E. Chapman, E. Barnes and C. Fairhurst. Reg. office: 64 Northgate, Cottingham, E.Yks.

GLOBE VENTURES LTD. Cap. £100. Merchants, importers, exporters and dealers in chemicals, plant, raw materials, etc. Directors: D. Pirani and J. E. Millers. Reg. office: 37 Harley Street, London W1.

YOUNG RESEARCH LABORATORIES LTD. Cap. £100. Research laboratory in all branches of science, chemistry and engineering, etc. Directors: J. K. King (director of Textilose Ltd., etc.); and H. S. Ashton (director of Schubert Society of Great Britain Ltd.). Reg. office: 12 Bruton Street, London W1.

MACCLEASTER CHEMICAL COMPANY LTD. Cap. £1,000. Manufacturers of and dealers in anti-corrosives, wood and metal preservatives, galvanising materials, etc. Directors: N. R. MacCleaster, T. H. Cleghorn and L. A. Gibson. Reg. office: 20 Chequer Street, St. Albans, Herts.

SPEBRA PRODUCTS MANUFACTURING CO. LTD. Cap. £100. To manufacture and sell industrial chemicals, etc. Directors: R. W. Stansfeld, George B. Smigel, California. Reg. office: Audrey House, Ely Place, London EC1.

TIMBER TREATMENTS LTD. Cap. £1,000. Manufacturers and distributors of, agents for and dealers in preparations, substances, products and mechanical and other traps for use in connection with the control and destruction of woodworm, death watch beetles and other pests, etc. Directors: D. R. Tucker and G. M. Nixon-Eckersall. Reg. office: Chapel Street, Thornbury, Glos.

FORMICA LTD. Cap. £3 million. To develop, produce, manufacture and deal in chemicals, resins, plastics and goods and articles made therefrom, etc. Thomas De La Rue and Co. Ltd. and the American Cyanamid Co. shall have the right to appoint and remove directors according to their holding of ordinary shares. Directors: G. Norman, G. Riddick, and C. Westall (appointed by Thomas De La Rue); and C. Moody and J. O'Conor, jnr. (appointed by American Cyanamid).

Reg. office: 84–6 Regent Street, London W1.

Chemical Stocks & Shares

QUIET AND SUBDUED MARKETS

Stauffer Chemicals Prospects

CONTINUED currency fears, together with little support, have kept markets at a low ebb over the last two weeks. Generally shares have shown little movement; ICI shares were down at one time on a large number of small sales, largely by the company's own employees, but later the shares rallied to 41s 3d.

Borax, after touching 29s settled back to 27s 1½d; elsewhere British Oxygen 36s, Distillers 23s 1½d, Gas Purification 20s and Greeff Chemicals 19s 10½d were virtually unchanged.

1957 High	1957 Low	Security	10 Sept.	Change on last two weeks
23/7½	17/9	Albright & W. 5/-	21/10½	—4½d
11/6	10/6	Anchor 5/-	11/6	—
1/2½	1/-	Ashe 1/-	1/1½	—
24/6	20/-	Bakelite 10/-	24/-	—6d
7/10½	5/7½	Bark, P. W. 5/-	5/9	—1½d
36/-	22/4½	Borax Dfd. 5/-	27/1½	—1/3
10/9	9/-	Bt. Chrome 5/-	10/9	—
13/10½	10/3	Bt. Glues 4/-	12/6	—
6/4½	4/9	BIP 2/-	5/9	+3d
8/6	5/6	Bt. Tar 2/6	8/1½	—1½d
35/-	27/3	Bt. Xylonite	31/6	+4½d
22/3	18/9	Brothertons 10/-	19/9	—
4/4½	3/7½	Coalite	4/3	—
60/3	48/3	Fison	55/6	—3d
43/-	24/-	Glaxo 10/-	41/9	—10½d
9/6	8/-	Hardman & H 5/-	8/9	+3d
34/6	24/1½	Hickson & W 10/-	34/3	—3d
46/6	38/10½	ICI	41/3	—7½d
4/9	2/7½	Kleemann 1/-	3/3	—1½d
22/1½	16/4½	Laporte 5/-	18/4½	—3d
22/-	18/4½	Lawes 10/-	19/9	—3d
19/4½	12/4½	Monsanto 5/-	18/-	—1/4½
15/6	12/9	Reichhold 5/-	14/9	—
11/9	9/-	Yorks Dye 5/-	11/3	—3d

Until a year or so ago, Stauffer Chemicals were thought of as producers almost exclusively of basic, heavy chemicals. Companies in this field have shown a trend of growth comparing favourably with that for the more colourful divisions of the industry. Recently, however, Stauffer have taken on a new look as they have announced developments in other fields, aided by the acquisition in 1956 of West End Chemicals, a producer of borax from which boron compounds are derived.

Stauffer Chemicals, with 50 plants in the US, have many products, most notably, sulphuric acid, carbon disulphide, carbon tetrachloride, caustic soda and chlorine. The acquisition of West End Chemicals adds to Stauffer's already strong position soda ash, borax, sodium sulphate and lime. These industrial chemicals account for three-quarters of the company's sales, the balance being largely made up by sales of agricultural chemicals. These comprise a diversified line of fungicides, herbicides, defoliants, insecticides, rodenticides, etc., and fertilisers.

Research and development expenditures which amounted to $2.7 million in 1956 (an increase of 30 per cent over 1955) are concentrated principally in several promising fields in which the company has an advantageous position—such as boron chemicals, metal chlorides, chlorinated solvents and intermediates for the textile, plastics and rubber industries. As one of only three producers of borax, working with this raw material for years, Stauffer are strategically placed in respect of one of the most promising of the metals, boron.

It has been revealed that Stauffer are major suppliers of boron trichloride, an intermediate in the production of the chemical fuels so much in the news recently as the result of announcements of large development programmes by Olin Mathieson and Callery Chemical.

Stauffer's financial position is well established and the outlook is improved by increasing research expenditures and entrance into the petrochemical field. This stock offers at a price of approximately $139 (London), a very promising long-term investment.

Market Reports

PRICES STEADY

LONDON Activity on the industrial chemicals market is now fully back to normal and there has been a good enquiry from the main consuming industries with contract delivery specifications for the textile and kindred trades covering good quantities. Reports indicate that buyers are paying more attention to forward requirements. The general run of the soda products are in good call on home and export account whilst the potash chemicals generally are in steady request. The supply position on the whole is fairly easy.

Apart from fluctuations in the prices of chemical compounds for the non-ferrous metals, values are very steady with the undertone slightly firmer. At the time of this report sulphate of copper is quoted at £75 2s 6d per ton less 2 per cent f.o.b. Liverpool.

The position on the coal-tar products market is unchanged and prices are well held. Pitch is in good call on home account. As from 10 September, the basic prices for dry white lead and red lead are lower at £128 10s and £120 10s per ton respectively, and litharge is £122 10s.

MANCHESTER Except for continued uncertainty in non-ferrous metal compounds, prices on the Manchester chemical market during the past week have maintained a firm front. Contracts for textile and other industrial chemicals are being drawn against satisfactorily and replacements buying by home consumers is on steady lines. The export movement is well maintained and a fair number of shippers' enquiries have been in the market. Among fertilisers there is a continued good demand for most grades of basic slag and fertiliser compounds.

GLASGOW The improvement reported last week in the Scottish market has been maintained, particularly in regard to the heavy textile industries, where requirements against contracts have been well demanded. There is still a fair number of enquiries being received for the export market, with a good volume of resultant business. Prices generally have remained firm.

Crosby Valve Expansion

The Wembley factory of the Crosby Valve and Engineering Co. Ltd. is expanding to meet increased demands. Housed in a new two-storey extension will be considerably increased assembly facilities and a duplicate test plant which will be used exclusively for customers' outside inspectors. On the first floor will be the assembly, setting and testing of Mason Neilan brass reducing valves and Crosby brass safety valves.

"VULCAN" BRAND IRON AND STEEL CARBOY HAMPERS SAFETY CRATES, PACKED CARBOYS

HARRIS (LOSTOCK GRALAM) LTD.

LOSTOCK GRALAM, NORTHWICH, CHESHIRE.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents),' which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATION

On sale 16 October or as soon as possible thereafter

Anti-thyroid compounds. National Research Development Corp. **728 384**

ACCEPTANCES

Open to public inspection on 23 October

Cyanine dyestuffs. Ilford, Ltd. **785 334**

Platinum-containing catalysts. May 24, 1955. Atlantic Refining Co. **785 132**

Preparation of aromatic carboxylic acids. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **785 072**

Extreme pressure lubricants. Shell Research, Ltd. **785 133**

Determining the amount of solids in a slurry. Smidth & Co., Aktieselskab., F. L. **785 335**

Compounds of the octahydrophenanthrene series and synthesis of compounds of the cyclopentano-dimethylpolyhydrophenanthrene series therefrom. Monsanto Chemical Co. **785 075**

Preparing agglomerate calcium phosphate and the product resulting. International Minerals & Chemical Corporation. **785 015**

Method of producing agglomerate calcium phosphate mixtures. International Minerals & Chemical Corporation. **785 016**

Production of vanadium metal. UK Atomic Energy Authority. **785 344**

Monazo dyestuffs of the benzene-azonaphthalene series and metal complexes thereof. Sandoz, Ltd. **785 345**

Manufacture of isonicotinyl hydrazine. Distillers Co., Ltd. **785 346**

Installation for the dehydration of sludges. Vereinigte Aluminium-Werke AG. **785 347**

Bis (hydroxyaryl) compounds. Naamlooze Vennootschap De Bataafsche Petroleum Maatschappij. **785 079**

Production of metal aluminium hydrides or aluminium hydride. Farbenfabriken Bayer AG. **785 348**

Separating nickel and cobalt. Lonza Electric & Chemical Works Ltd. **785 350**

Agent for protection against moths and beetles. Farbenfabriken Bayer AG. **785 080**

Production of O, O-dimethyl phosphorothiolic acid esters. Farbenfabriken Bayer AG. **785 141**

Quaternary isoindoline compounds. Ciba Ltd. **785 142**

Therapeutically active derivatives of barbituric acid. Taub, W. **785 248**

Polyazo dyestuffs. Badische Anilin- & Soda-Fabrik AG. **785 084**

Glyceride molecular rearrangement process. Hedley & Co., Ltd., T. **785 147**

Liquid disinfectant for seed. Fahlberg-List Ges. **785 085**

Unsaturated ketones and a process for the manufacture thereof. Hoffmann-La Roche & Co. AG., F. **785 086**

Activated bleaching clay. National Research Council. **785 088**

Preparation of low molecular weight polymers of esters of methacrylic acid. Montecatini Soc. Generale Per L'Industrie Mineraria e Chimica. **785 148**

Treatment of distillation or synthesis gases. Simon-Carves, Ltd. (Otto & Co., Dr. C.). **785 150**

α-hydroxycarbocylic acids and derivatives thereof. National Research Corp. **785 152**

Separation of acid gases from coal carbonisation gases. Koppers Co., Inc. **785 153**

Deposition of molten metals. Air Reduction Co., Inc. **784 967**

Explosive charges. Borg-Warner Corp. and Welex Jet Services, Inc. **785 155**

Ion exchange resins. Chemical Process Co. **785 157**

Preparing hydrofining catalyst and processes for using same. Esso Research & Engineering Co. [Addition to 742 764.] **785 158**

Cellular synthetic resin compositions. Dunlop Rubber Co., Ltd. **785 256**

Production of glass fibres, etc. Owens-Corning Fiberglas Corp. **785 257**

Mouldable copolymers of styrene and acrylonitrile. Dow Chemical Co. **785 159**

Polyvinyl acetal sulpho-acids. Farbwerke Hoechst AG. **785 164**

Salts of oxyalkylated fatty amines. Poor & Co. **785 166**

Production of a normally solid polymeric hydrocarbon material. Standard Oil Co. **784 970**

Redox tvpe polymerisation. Polymer Corp. Ltd. **785 169**

Polyvinyl acetals. Celanese Corp. of America. **785 170**

Hypotensive and sedative preparations. Smith Kline & French International Co. **785 262**

Rigid and impact resistant vinyl halide resin composition. Goodyear Tire & Rubber Co. **785 172**

Separation of the antibiotic spiramycin into its components. Soc. Des Usines Chimiques Rhone-Poulenc. [Addition to 758 726.] **785 098**

Unsaturated aliphatic esters. Celanese Corp. of America. **785 100**

Green triszo dyestuffs. Badische Anilin- & Soda-Fabrik AG. **785 101**

Amide-like derivatives of lysergic and isolysergic acids. Sandoz, Ltd. **785 173**

Procedure and apparatus for starting an oxidation process. Sterling Drug, Inc. **785 267**

Production of emulsions. Midland Silicones, Ltd. **785 174**

Powdered synthetic tanning agents. Farbenfabriken Bayer AG. **785 104**

Production of elastic coatings. Farbenfabriken Bayer AG. **785 175**

Oxidation regulation. Sterling Drug, Inc. **785 269**

Amide bases and salts thereof. Wellcome Foundation, Ltd. **785 270**

Hexahydrobenzylamine. Geigy AG. **785 108**

Alloys. Mond Nickel Co., Ltd. **785 271**

4-hydroxypyrazoles. Badische Anilin- & Soda-Fabrik AG. **785 185**

Hydrogenated spiramycins. Soc. Des Usines Chimiques Rhone-Poulenc. **785 191**

Polyvinyl oxo-alkanals. Esso Research & Engineering Co. **785 193**

Oil-soluble basic monovalent metal salts of organic acids. Naamlooze Vennootschap De Bataafsche Maatschappij. **785 196**

Extreme pressure lubricants. Shell Research, Ltd. **785 198**

Continuous filtration apparatus. Aktiebolaget Bofors. **784 980**

Complex calcium salt of 4-aminosalicyclic acid. Gohei Tanabe & Co., Ltd. **785 205**

Titanium and zirconium alloys. Western Electric Co., Inc. **785 278**

1 : 1-difluoro-1-chlorethane. Farbwerke Hoechst AG. **785 209**

Organic phosphorus compounds. Food Machinery & Chemical Corp. [Divided out of 783 697.] **784 985** **784 986**

Luminescent materials. Thorn Electrical Industries, Ltd. **785 114**

Apparatus for immersing containers in a liquid. Hoover, Ltd. **785 294**

Composition for eliminating minor element deficiencies in plant growing media. Dow Chemical Co. **785 024**

Production of fatty acids. Ruhrchemie AG. **785 296**

Production of iron catalysts for organic systhesis. Council for Scientific & Industrial Research. **785 116**

Manufacture and use of complex iron salts. Ciba Ltd. **785 025**

Metalliferous mono-azo dyestuffs of the benzene-azo-pyrazolone series. Ciba Ltd. [Addition to 741 602.] **785 026**

Plant growth regulant compositions. American Chemical Paint Co. **785 028**

Polymers from selected steam cracked distillate streams. Esso Research & Engineering Co. [Adition to 743 886.] **784 938**

Isolation of colouring compounds from caramelized sugars. Union Starch & Refining Co. **785 299**

Synthetic linear soluble polymers and copolymers comprising a major proportion of carboxylic acid amide linkages. Du Pont De Nemours & Co., E.I. **785 214**

Means for the estimation of small quantities of gaseous impurities in rare gases. British Oxygen Co., Ltd. [Cognate application 28265.] **785 302**

Production of sulphinyl ethyl thiophosphates. Fisons Pest Control, Ltd. **785 030**

Manufacture of oxytetracycline. Farbwerke Hoechst AG. **785 304**

Self-hardening surface coating compositions. Deutsche Gold-Und Silber-Scheideanstalt Vorm. Roessler. **785 032**

Phosphated metallisable azo dyestuffs. Imperial Chemical Industries, Ltd., Todd, A. R., and Davies, R. R. **785 038**

Liquid applicators. Hopkins, C. L. **784 941**

Preparing manganese-bearing materials for extraction of manganese. Electric Furnace Products Co., Ltd. **785 307**

Pressure sensitive adhesives. Distillers Co., Ltd. **785 119**

Production of chromous chloride solutions. Ruhrchemie AG. **785 040**

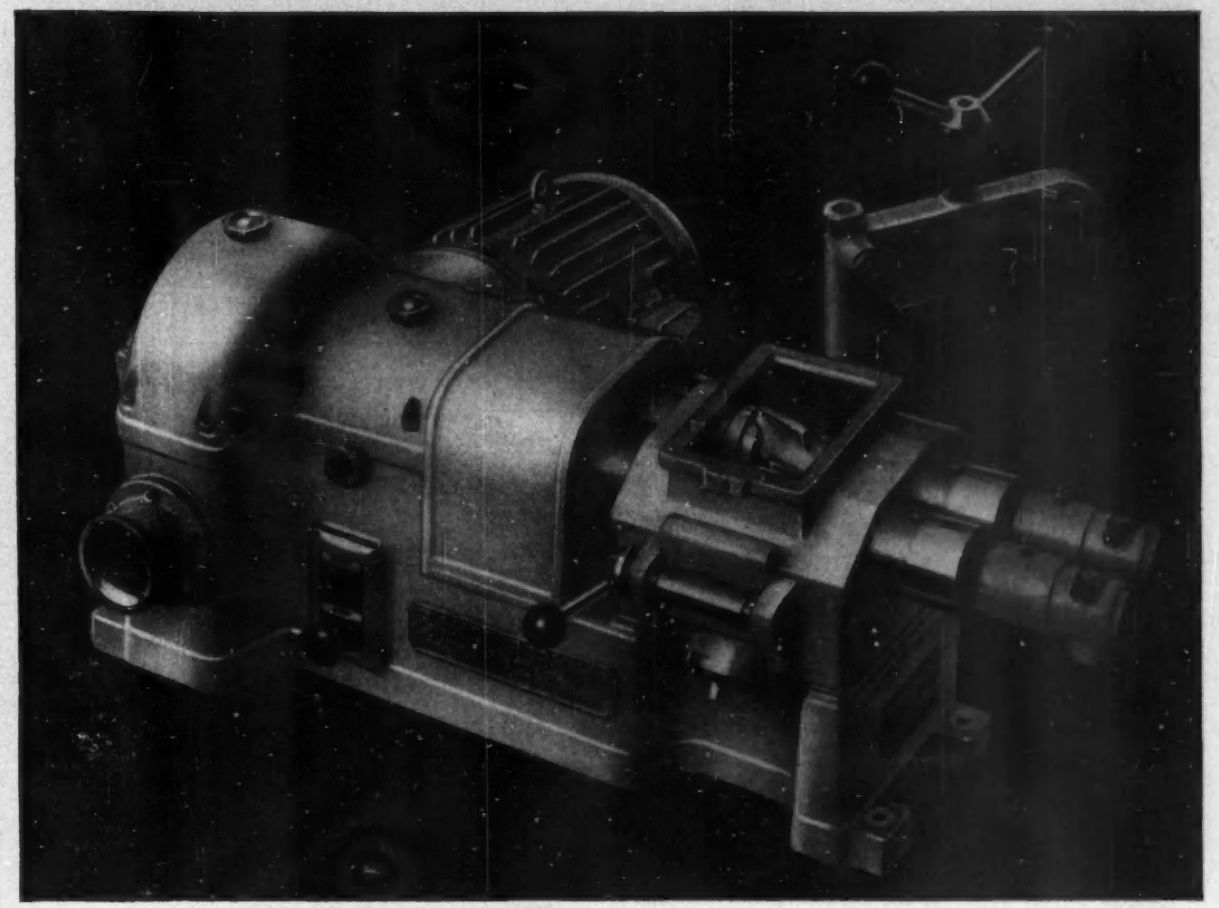
Manufacture of cumbustible gas. Humphreys & Glasgow, Ltd. **785 311**

Stable petroleum distillate fuels. Standard Oil Co. **784 944**

Monoazo dyestuffs derived from cyanuric chlorides. Imperial Chemical Industries, Ltd. **785 120** **785 222**

Hydrocatalytic desulphurisation processes. British Petroleum Co., Ltd. **785 312**

UNIVERSAL MIXING MACHINES



For many years we have designed and built Mixers in a range of types and sizes for both experimental and production work. To-day our Laboratory Mixers enable the research chemist or engineer to evaluate pilot mixings economically and with great accuracy. Our Size 3, of 600 c.c. capacity and driven by 4 H.P. motor illustrated here is a special Heavy Duty Masticator for Laboratory use.

BAKER PERKINS LTD
Engineers
WESTWOOD WORKS - PETERBOROUGH

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of CHEMICAL AGE direct to your address from the printer (postage paid by the publishers), and a copy of CHEMICAL AGE YEAR BOOK.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

OFFICIAL APPOINTMENTS

MINISTRY OF HOUSING AND LOCAL GOVERNMENT. The Civil Service Commissioners invite applications from men for about twelve pensionable posts (a) six District Alkali Inspectors (b) six Alkali Inspectors under the ALKALI, etc., **WORKS REGULATION ACT, 1906.** Vacancies at Birmingham, Bristol, Cambridge, Cardiff, Leeds, Liverpool, London, Manchester, Newcastle-on-Tyne, Sheffield, Stoke-on-Trent. Considerable travelling: current regulations provide for first-class rail or car mileage allowance plus subsistence allowance. Candidates must be prepared to serve in any centre. Duties include the administration of the Alkali, etc., Works Regulation Act, 1906, as extended from time to time by Orders, to control the emission to air of noxious fumes, smoke dust, etc., from certain industries, to ensure the proper design, layout and operation of plant for this purpose.

The posts afford scope for initiative and individual responsibility. Inspectors will enjoy considerable freedom of action within their sphere, and will be expected to organise their work and to take decisions with the minimum of supervision. It will be an important part of their duties to establish and maintain good relations with industrial managements and local authorities in their areas.

Age on 1st August, 1957, posts (a) at least 35; posts (b) at least 30. Candidates must be University Graduates in Science or Technology and wide experience and knowledge of chemical or fuel technology and engineering and of related industries are essential. Candidates for posts (a) must have had about ten years experience and for posts (b) about five years. London starting salary for posts (a) £1,590 at 35 up to £1,780 at 38 or over, salary maximum £2,050; and for posts (b) £1,150 at 30 up to £1,280 at 33 or over, salary maximum £1,720. Slightly less for posts outside London. Exceptionally, higher starting pay at 38 (or over) or 33 (or over) respectively if outstandingly well qualified. Prospects of promotion. Five day week. Five weeks annual leave. Non-contributory retirement pension and gratuity. Application form and full particulars from the Secretary, Civil Service Commission, Scientific Branch, 30 Old Burlington Street, London, W.1, quoting No. S 4748/57. Applications to be returned by 30th September, 1957.

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candidates since 1944 have been trained by T.I.G.B. All seeking quick promotion in the Chemical and Allied Industries should send for the T.I.G.B. Prospectus. 100 pages of expert advice, details of Guaranteed Home Study Courses for A.M.I.Chem.E., B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a wide range of Diploma Courses in most branches of Engineering. Send for your copy today—**FREE.** T.I.G.B. (Dept. 84), 29 Wright's Lane, London, W.8.

EDUCATIONAL: continued

LANCASHIRE EDUCATION COMMITTEE
WIDNES COLLEGE OF FURTHER EDUCATION
Full-time Course for Graduate Membership, Royal Institute of Chemistry

A regional course for holders of a good Higher National Certificate in Chemistry or equivalent will be held from 16th September to 27th June next. Course fee, ten guineas.

Further information may be obtained from the Principal, College of Further Education, Victoria Square, Widnes. Phone: Widnes 2532.

FOR SALE

600

5 ft. diam. Single Roll Edge Runner Mill, by Torrance. C.I. Pan 12 in. deep. C.I. Roll 3 ft. diam. x 9 in. face. Bottom slide discharge 6½ in. x 8 in. Underdriven through bevel gear.

Four Vacuum Drying Ovens by Scott. Ribbed C.I. constr. Int'l. dimensions 6 ft. by 4 ft. 3 in. by 3 ft. 8 in., with 12 steam coil shelves, tray clearance 2 in. Suitable 27/28 in. vacuum. Heavy dished door. Complete with Vacuum Pump.

20in. diam. Broadbent Oil Extractor. Max. load 260 lb. at 1,000 r.p.m. Lift out basket 10 in. deep, ¼ in. perfs. M.S. Cover with safety lock. Motorized.

800 Gal. Stainless steel tot. encl. Vessel 5 ft. diam. x 5 ft. deep on straight, 18 in. dished bottom, 2 in. flanged outlet, Constr. 10G F.D.P. Bottom of straight portion fitted five 6kW. Immersion Heater 415/3/50. Dull polished int., descaled ext.

NEW STAINLESS STEEL STORAGE VESSELS AND TANKS, having capacities ranging from 8 gallons to 1,000 gallons.

NEW PORCELAIN AND SILEX LINED BALL MILLS, having capacities ranging from 9 gallons to 260 gallons.

GEORGE COHEN SONS & CO. LTD,
WOOD LANE, LONDON, W.12
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS
Tel.: Pudsey 2241

★ ★ ★ **WHEAT STARCH** ★ ★ ★
at competitive prices.
Specially refined quality for the food trades, and other grades suitable for many industrial purposes.
Starch Division
Procea Products, Ltd. (Dept. 1.)
47 Dean Street,
London, W.1.

BOX NUMBERS: *Reply c/o "Chemical Age" · Bouverie House · Fleet Street EC4.*

FOR SALE: continued

PHONE 98 STAINES

ALUMINIUM Enc. Oval (3 comp) Tank 10 ft. by 6 ft. by 4 ft. deep. S.S. Jac. Enc. Elec. Mixers (2) 40, (2) 100, and (2) 200 gall.

S.S. and Chrome Portable Emulsifiers/Mixers ¼, ½, 1 and 2 h.p. A.C.

S.S. lined Autoclaves 6 ft. by 3 ft. 100 w.p.

(40) "Z" and Fin Blade Mixers up to 31 in. by 30 in. by 24 in. Pumps, Hydros, Grinders, and Crushers, Condensers, etc.

HARRY H. GARDAM & CO. LTD.

MORTON, SON AND WARD LIMITED
offer

NEW UNITS in stainless or mild steel made to requirements:

CONDENSERS,
MIXING VESSELS,
JACKETED PANS with or without Mixing gear,
'MORWARD' 'U' shaped trough **MIXERS** with or without jackets,
TANKS: CYLINDERS: RECEIVERS: PRESSURE VESSELS and **AUTOCLAVES.**

NEW (ex stock):

JACKETED PANS:

100g, 150g and 200g in mild steel, suitable for 100 lb in jacket. With or without mixing gear.

SECOND HAND (ex stock):

600g totally enclosed **JACKETED VESSEL,** 80 lb p.s.i. in jacket, 50 lb internal.

600g open top **JACKETED VESSEL,** 80 lb in jacket.

350g (2 available) totally enclosed **JACKETED PANS** 80 lb in jacket, 50 lb internal.

400g open top **JACKETED PAN,** open top, 80 lb in jacket.

300/400g **PRESSURE VESSELS** with detachable tops, standing on 4 feet, 80 lb p.s.i. internal pressure.

STIRRING GEAR can be fitted to any of the above vessels.

Enquiries invited:

MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
Lancs.
'Phone Saddleworth 437

ALUMINIUM PORTABLE TANKS, 6 ft. 6 in. long by 3 ft. 6 in. by 3 ft. 6 in. Mounted on Wheeled Trolleys. Three available. **WINKWORTH MACHINERY LTD.,** 65 High Street, Staines, Middlesex. Telephone 1010.

---

1. MANLOVE ALLIOTT OVAL SHAPED DISINFECTOR steam jacketed for 30 lb. psi, inside measurements 30 in. by 50 in. by 7 ft., hinged door at each end also travelling cage 28 in. wide by 22 in. deep. **THOMPSON & SON (MILLWALL) LTD.,** Millwall, E.14. Tel. East 1844.

WANTED

INDUSTRIAL BY-PRODUCTS LTD., 16 Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

WORK WANTED & OFFERED

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

PULVERISING of every description of chemical and other materials. Collections, storage, deliveries. **THOMAS HILL-JONES, LIMITED, INVICTA WORKS, BOW COMMON LANE, LONDON, E.3. (TELEPHONE: EAST 3285.)**

CRUSHING, GRINDING, MIXING and DRYING for the trade

THE CRACK PULVERISING MILLS LTD.
Plantation House,
Mincing Lane,
London, E.C.2

PATENTS & TRADE MARKS

The proprietor of British Patent No. 709848, entitled **"NEBULIZER FOR ADMINISTERING MEDICAMENTS"** offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG,** 14 E. Jackson Blvd., Chicago 4, Illinois, USA.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON
(Established 1855)
Auctioneers, Valuers and Fire Loss Assessors of
CHEMICAL WORKS PLANT AND MACHINERY
York House, 12 York Street, Manchester
Telephone 1937 (2 lines) Central Manchester

PAPER BAGS
POCKETS
COUNTER ROLLS

STONEHOUSE
PAPER & BAG MILLS
STONEHOUSE, GLOS.

Rockets and Guided Missiles

By

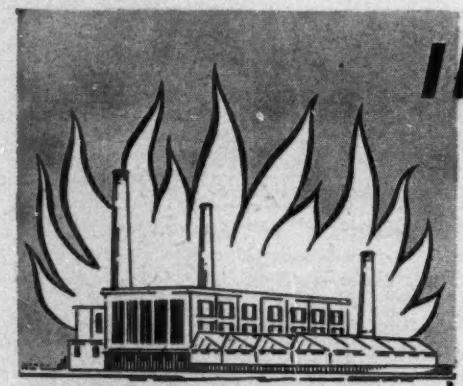
JOHN HUMPHRIES

INTENDED in the main for engineers and technicians, this complete survey of present-day achievements and possible future developments presents the latest information on rocket motors and their applications from an engineer's point of view. Both solid and liquid propellant motors are discussed, the latter more fully as being of greater interest to the engineer. The first half of the book covers propellants, motors and components, the second, the applications of these motors to missiles and aircraft, and in conclusion a review of potentialities for the future is appended. The author has had wide practical experience following a brilliant scholastic career, and is at present actively engaged on rocket research.

31*s.* (*postage paid*)

Ernest Benn Limited

Bouverie House · Fleet Street · London · EC4



INDUSTRY must be PROTECTED

In the years 1952 to 1955 the estimated cost of fire damage was respectively, £24,3 million, £25,1 million, £26,2 million and £27,6 million, and of the total number of fires attended by Fire Brigades approximately 10,000 occurred in industrial and commercial premises.

The resultant interference with productive capacity and destruction of premises, stock and machinery might have been reduced by making works fire protection services more efficient and up to date.

★ *FIRE PROTECTION REVIEW*, recognised as the Technical Newspaper of the Industrial Fire Services, carries month by month, many features and articles of special value to executives in any way connected with Industrial Fire protection and extinction and safety measures.

★ FILL IN THE FORM FOR A FREE SPECIMEN COPY AND SUBSCRIPTION DETAILS

THE MANAGER

FIRE PROTECTION REVIEW

BENN BROTHERS LIMITED,
Bouverie House, Fleet Street,
LONDON, E.C.4., ENGLAND

Please send without obligation on our part, a specimen copy of FIRE PROTECTION REVIEW and details of subscriptions:—

For attention of.....

Name of Firm.....

Address .....

.....

Date .....

Classified Advertisement Order Form

To The Manager
CHEMICAL AGE
Bouverie House
Fleet Street, London E.C.4

Please insert the following in your next issue and for..... *weeks thereafter* *Date*.....

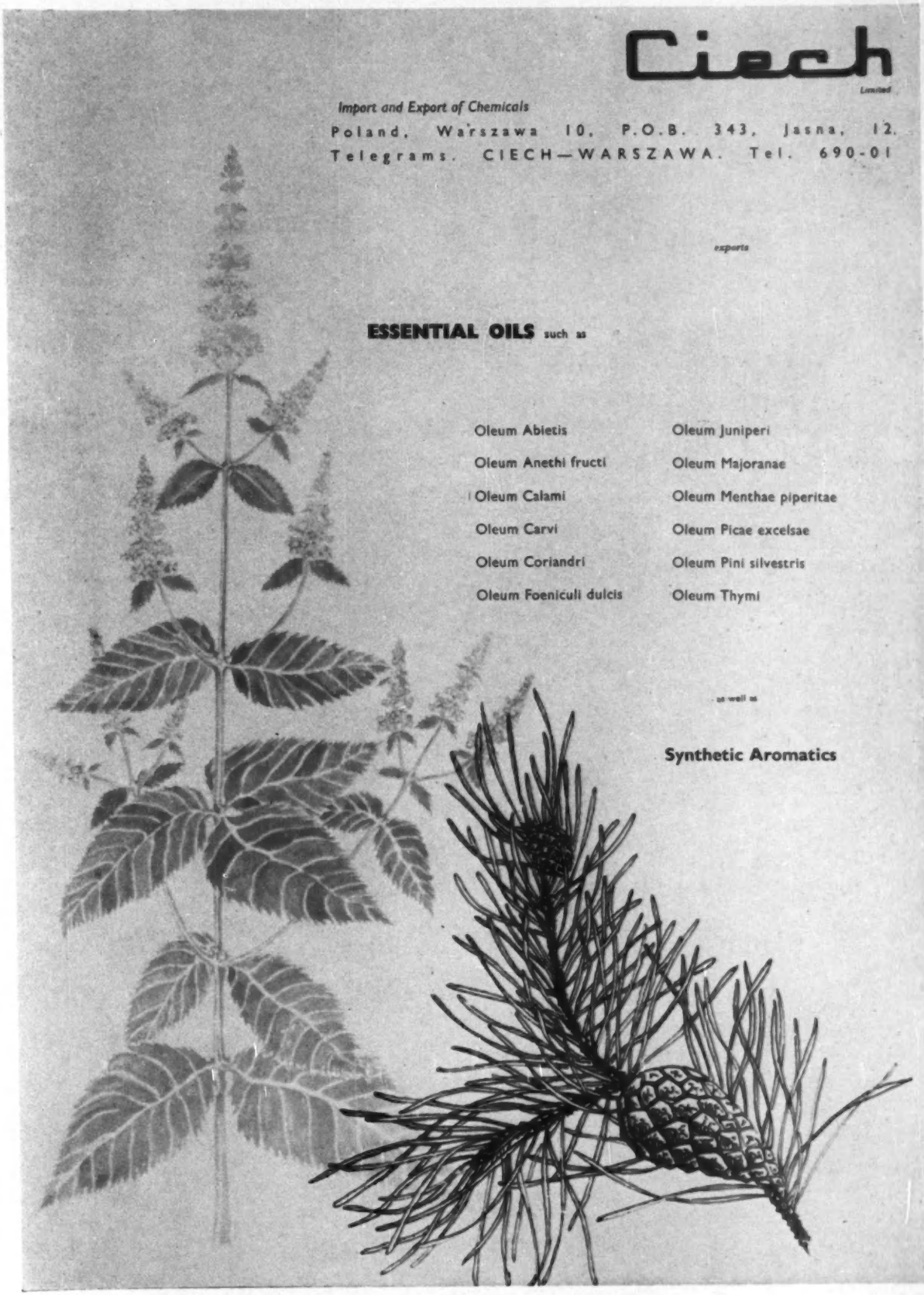
SITUATIONS VACANT	· EDUCATIONAL
OFFICIAL APPOINTMENTS	· WANTED
FOR SALE	· INVITATION TO TENDER
AUCTIONEERS, VALUERS, etc.	· PATENTS
WORK WANTED AND OFFERED	

CLASSIFIED RATES All sections **5d.** per word. Minimum **8/-**. Three or more insertions **4d.** per word. Box Number **2/-** extra. Up to 10 a.m. Tuesday for insertion same week.

SEMI-DISPLAY **30/-** per inch. Three or more insertions **25/-** per inch.

Name .....

Address.....



Ciech
Limited

Import and Export of Chemicals

Poland, Warszawa 10, P.O.B. 343, Jasna, 12.
Telegrams. CIECH—WARSZAWA. Tel. 690-01

exports

ESSENTIAL OILS such as

Oleum Abietis
Oleum Anethi fructi
Oleum Calami
Oleum Carvi
Oleum Coriandri
Oleum Foeniculi dulcis
Oleum Juniperi
Oleum Majoranae
Oleum Menthae piperitae
Oleum Picae excelsae
Oleum Pini silvestris
Oleum Thymi

as well as

Synthetic Aromatics

FOR THE CHEMICAL INDUSTRY
FOR THE GAS INDUSTRY
FOR ALL
INDUSTRIAL USES
WHERE A RELIABLE
FORM OF BLOWING
OR BOOSTING
IS REQUIRED

V50 BOOSTERS BLOWERS

EX-STOCK
(BARE SHAFT END)
DUTIES
600 C.F.M. AT 13" W.G. TO 1000 C.F.M. AT 9" W.G. } ON GAS
600 C.F.M. AT 26" W.G. 1000 C.F.M. AT 18" W.G. } ON AIR

ASK FOR PUBLICATION No. P/79

THE BRYAN DONKIN COMPANY LIMITED
CHESTERFIELD — LONDON

BRILLIANT AVIROLS *for softening and finishing*

Hickson & Welch Ltd. *Castleford*

Printed in England by Staples Printers Limited at their Bayswater, London, establishment, and published by Benn Brothers Ltd., at Bouverie House, 154 Fleet Street, E.C.4. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A., Post Office.